



7705 SERVICE AGGREGATION ROUTER | RELEASE 8.0.R7

Interface Configuration Guide

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1 Preface

1.1 About This Guide

This guide describes system concepts and provides configuration examples to provision CSM cards, adapter cards, modules and ports for the 7705 SAR.

This guide is organized into functional chapters and provides concepts and descriptions of the implementation flow, as well as Command Line Interface (CLI) syntax and command usage.

For hardware information on the 7705 SAR chassis, adapter cards, and modules, including installation, connections, LEDs, and pinouts, refer to:

- 7705 SAR-8 Chassis Installation Guide
- 7705 SAR-18 Chassis Installation Guide
- 7705 SAR-A Chassis Installation Guide
- 7705 SAR-Ax Chassis Installation Guide
- 7705 SAR-H Chassis Installation Guide
- 7705 SAR-Hc Chassis Installation Guide
- 7705 SAR-M Chassis Installation Guide
- 7705 SAR-O Chassis Installation Guide
- 7705 SAR-W Chassis Installation Guide
- 7705 SAR-Wx Chassis Installation Guide
- 7705 SAR-X Chassis Installation Guide
- 7705 SAR 10-port 1GigE/1-port 10GigE X-Adapter Card Installation Guide
- 7705 SAR 2-port 10GigE (Ethernet) Adapter Card/Module Installation Guide
- 7705 SAR 4-port SAR-H Fast Ethernet Module Installation Guide
- 7705 SAR 4-port T1/E1 and RS-232 Combination Module Installation Guide
- 7705 SAR 6-port E&M Adapter Card Installation Guide
- 7705 SAR 6-port FXS Adapter Card Installation Guide
- 7705 SAR 6-port SAR-M Ethernet Module Installation Guide
- 7705 SAR 8-port FXO Adapter Card Installation Guide
- 7705 SAR 8-port Voice & Teleprotection Card Installation Guide
- 7705 SAR Auxiliary Alarm Card Installation Guide
- 7705 SAR CWDM OADM Adapter Card/Module Installation Guide

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- 7705 SAR DS3/E3 Adapter Card Installation Guide
 - 7705 SAR DSL Module Installation Guide
 - 7705 SAR Ethernet/Gigabit Ethernet Adapter Card Installation Guide
 - 7705 SAR GNSS Receiver Card Installation Guide
 - 7705 SAR GPON Module Installation Guide
 - 7705 SAR GPS Receiver Module Installation Guide
 - 7705 SAR Integrated Services Card Installation Guide
 - 7705 SAR Packet Microwave Adapter Card Installation Guide
 - 7705 SAR Power Injector Card Installation Guide
 - 7705 SAR Serial Data Interface Card Installation Guide
 - 7705 SAR SONET/SDH Adapter Card Installation Guide
 - 7705 SAR T1/E1 ASAP Adapter Card Installation Guide



Note: This manual generically covers Release 8.0 content and may contain some content that will be released in later maintenance loads. Please refer to the 7705 SAR OS 8.0.Rx Software Release Notes, part number 3HE11057000xTQZZA, for information on features supported in each load of the Release 8.0 software.



Note:

As of Release 7.0, support for the following hardware has been deprecated:

- CSMv1
- 7705 SAR-F
- 8-port Ethernet Adapter card, version 1
- 16-port T1/E1 ASAP Adapter card, version 1

These components are no longer recognized in the release.

1.1.1 Audience

This guide is intended for network administrators who are responsible for configuring the 7705 SAR routers. It is assumed that the network administrators have an understanding of networking principles and configurations. Concepts described in this guide include the following:

- CLI concepts
- adapter card and port configuration
- QoS policies
- services

1.1.2 List of Technical Publications

The 7705 SAR documentation set is composed of the following guides:

- 7705 SAR Basic System Configuration Guide
This guide describes basic system configurations and operations.
- 7705 SAR System Management Guide
This guide describes system security and access configurations as well as event logging and accounting logs.
- 7705 SAR Interface Configuration Guide
This guide describes card and port provisioning.
- 7705 SAR Router Configuration Guide
This guide describes logical IP routing interfaces, filtering, and routing policies.
- 7705 SAR MPLS Guide
This guide describes how to configure Multiprotocol Label Switching (MPLS), Resource Reservation Protocol for Traffic Engineering (RSVP-TE), and Label Distribution Protocol (LDP).
- 7705 SAR Services Guide
This guide describes how to configure service parameters such as service access points (SAPs), service destination points (SDPs), customer information, and user services.
- 7705 SAR Quality of Service Guide
This guide describes how to configure Quality of Service (QoS) policy management.

- 7705 SAR Routing Protocols Guide

This guide provides an overview of dynamic routing concepts and describes how to configure them.

- 7705 SAR OAM and Diagnostics Guide

This guide provides information on Operations, Administration and Maintenance (OAM) tools.

1.1.3 Technical Support

If you purchased a service agreement for your 7705 SAR router and related products from a distributor or authorized reseller, contact the technical support staff for that distributor or reseller for assistance. If you purchased a Nokia service agreement, follow this link to contact a Nokia support representative and to access product manuals and documentation updates:

[Product Support Portal](#)

2 7705 SAR Interface Configuration Process

[Table 1](#) lists the tasks that are required to provision CSM cards, adapter cards, ports, and SCADA bridges.

This guide is presented in an overall logical configuration flow. Each section describes a software area and provides CLI syntax and command usage to configure parameters for a functional area.

Table 1 Configuration Process

Area	Task/Description	Chapter
Provisioning	Configure chassis slots and cards	Configuring the IOM and Card Slot
	Configure adapter cards	Configuring Adapter Cards and Modules
	Configure ports and bridges	Configuring Ports Configuring SCADA Bridges
Reference	List of IEEE, IETF, and other proprietary entities	Standards and Protocol Support

3 7705 SAR Interfaces

This chapter provides information about configuring chassis slots, cards, and ports.

Topics in this chapter include:

- [Configuration Overview](#)
- [Port Features](#)
- [802.1x Network Access Control](#)
- [MAC Authentication](#)
- [Link Layer Discovery Protocol \(LLDP\)](#)
- [Surveillance, Control, and Data Acquisition \(SCADA\) Support](#)
- [Configuration Notes](#)
- [Configuring Physical Components with CLI](#)
- [Configuration Command Reference](#)
- [Show, Monitor, Clear, and Debug Command Reference](#)

3.1 Configuration Overview

This guide uses the term “preprovisioning” in the context of preparing or preconfiguring entities such as chassis slots, the IOM, adapter cards, ports, and interfaces, prior to hardware actually being installed in the chassis. These entities can be installed but not enabled. When the entity is in a **no shutdown** state (administratively enabled), the entity is considered to be provisioned.

Nokia 7705 SAR routers provide the capability to configure chassis slots to accept specific adapter card types and set the relevant configurations before the equipment is actually installed. The preprovisioning ability allows you to plan your configurations as well as monitor and manage your router hardware inventory. Ports and interfaces can also be preprovisioned. When the functionality is needed, the cards can be inserted into the appropriate chassis slots as required.

The following sections are discussed:

- [Configuring the IOM and Card Slot](#)
- [Configuring Adapter Cards and Modules](#)
- [Configuring Ports](#)
- [Configuring SCADA Bridges](#)

3.1.1 Configuring the IOM and Card Slot

The 7705 SAR card slot ID is always 1 and the card type for the IOM is always iom-sar.

On the 7705 SAR-8 and 7705 SAR-18, the CSM, which can only be installed in slot A or B of the chassis, does not need to be provisioned. However, the IOM, which is virtualized in the 7705 SAR software, must be activated before the adapter cards, ports, and SCADA bridges can be preprovisioned and configured. The IOM is activated by designating it a card slot ID and card type. This enables the chassis slots to accept the adapter cards.



Note: On the 7705 SAR-8, the CSM is called the CSMv2; both terms are used interchangeably in these guides. The CSMv2 supports bandwidth of 10 Gb/s, 2.5 Gb/s and 1 Gb/s in the first two adapter card slots and 2.5 Gb/s and 1 Gb/s in the remaining four adapter card slots. Support for 2.5 Gb/s and 10 Gb/s adapter cards by the CSMv2 is only available on the 7705 SAR-8 Shelf V2.

The 7705 SAR-M (all variants), 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-A (both variants), 7705 SAR-Ax, 7705 SAR-W, 7705 SAR-Wx (all variants), and 7705 SAR-X have a fixed physical configuration and each router uses only one control and switching functional block, which is referred to on the CLI as CSM A. The CSM and IOM do not need to be provisioned in order to provision the interface at the adapter card level.

The slot ID (1) is used as part of the adapter card and port identifier on the CLI.

3.1.2 Configuring Adapter Cards and Modules

This section contains information on the following topics:

- [Provisioning Chassis Slots for Adapter Cards](#)
- [Maximum Number of Adapter Cards in a Chassis](#)
- [Evolution of Ethernet Adapter Cards, Modules, and Platforms](#)
- [Channelized Adapter Card Support](#)

3.1.2.1 Provisioning Chassis Slots for Adapter Cards

A chassis slot and card type must be specified and provisioned before an adapter card can be provisioned. A chassis slot is a physical slot designated with an MDA ID. On the 7705 SAR-8, the MDA ID is from 1 to 6. On the 7705 SAR-18, the MDA ID is from 1 to 12 for the MDA slots and from X1 to X4 for the XMDA slots. An adapter card is provisioned when a card designated from the allowed adapter card types is inserted. A preprovisioned adapter card slot can remain empty without conflicting with populated slots.

The adapter cards can be installed in the chassis in any combination that does not exceed the maximum number. However, network applications require at least one network-capable adapter card to be installed as part of the mix.

Once installed and enabled, the system verifies that the installed adapter card type matches the configured parameters. If the parameters do not match, the adapter card remains offline.

3.1.2.2 Maximum Number of Adapter Cards in a Chassis



Note: Unless otherwise specified, references to adapter cards with multiple versions include all versions of the cards.

A maximum of six adapter cards can be installed in the 7705 SAR-8 chassis. The following adapter cards are supported:

- 2-port 10GigE (Ethernet) Adapter card (maximum of 4 in a 7705 SAR-8 with CSMv2)
- 2-port OC3/STM1 Channelized Adapter card (maximum of 6, depending on channelization and CSM variant installed – see note below)
- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card (maximum of 4 in a 7705 SAR-8 with CSMv2)
- 4-port OC3/STM1 Clear Channel Adapter card (maximum of 6)
- 4-port DS3/E3 Adapter card (maximum of 6, depending on channelization and CSM variant installed – see note below)
- 6-port E&M Adapter card (maximum of 6)
- 6-port FXS Adapter card (maximum of 6)
- 6-port Ethernet 10Gbps Adapter card (maximum of 6 in a 7705 SAR-8 Shelf V2 with CSMv2 only)
- 8-port Ethernet Adapter card (maximum of 6)
- 8-port FXO Adapter card (maximum of 6)
- 8-port Gigabit Ethernet Adapter card (maximum of 6)
- 8-port Voice & Teleprotection card (maximum of 6)
- 12-port Serial Data Interface card (maximum of 6)
- 16-port T1/E1 ASAP Adapter card (maximum of 6)
- 32-port T1/E1 ASAP Adapter card (maximum of 6)
- Auxiliary Alarm card (maximum of 6)
- CWDM OADM Adapter card (maximum of 6)
- Integrated Services card (maximum of 6)
- Packet Microwave Adapter card (maximum of 6)
- Power Injector card (maximum of 4)

A maximum of 12 MDA adapter cards and 4 XMDA adapter cards can be installed in the 7705 SAR-18 chassis. The following adapter cards are supported:

- 2-port 10GigE (Ethernet) Adapter card (maximum of 6)
- 2-port OC3/STM1 Channelized Adapter card (maximum of 12, depending on channelization – see note below)
- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card (maximum of 6, depending on channelization – see note below)
- 4-port OC3/STM1 Clear Channel Adapter card (maximum of 12)
- 4-port DS3/E3 Adapter card (maximum of 12, depending on channelization – see note below)
- 6-port E&M Adapter card (maximum of 12)
- 6-port FXS Adapter card (maximum of 12)
- 6-port Ethernet 10Gbps Adapter card (maximum of 12)
- 8-port Ethernet Adapter card, version 2 (maximum of 12)
- 8-port FXO Adapter card (maximum of 12)
- 8-port Gigabit Ethernet Adapter card (maximum of 12)
- 8-port Voice & Teleprotection card (maximum of 12)
- 10-port 1GigE/1-port 10GigE X-Adapter card (maximum of 4)
- 12-port Serial Data Interface card (maximum of 12)
- 16-port T1/E1 ASAP Adapter card, version 2 (maximum of 12)
- 32-port T1/E1 ASAP Adapter card (maximum of 12)
- Auxiliary Alarm card (maximum of 12)
- CWDM OADM Adapter card (maximum of 12)
- Integrated Services card (maximum of 12)
- Packet Microwave Adapter card (maximum of 12)
- Power Injector card (maximum of 8)

**Note:**

- On a 7705 SAR-8 chassis with a CSMv2:
 - a maximum of six 2-port OC3/STM1 Channelized Adapter cards can be installed in MDA slots 1 to 6 if DS3 channelization is being used. If DS1/E1 or DS0 (64 kb/s) channelization is being used, a maximum of four 2-port OC3/STM1 Channelized Adapter cards can be installed in MDA slots 1 to 6.
 - a maximum of six 4-port DS3/E3 Adapter cards can be installed in MDA slots 1 to 6 if DS3/E3 or DS1/E1 channelization is being used. If DS0 (64 kb/s) channelization is being used, a maximum of four 4-port DS3/E3 Adapter cards can be installed in MDA slots 1 to 6.
 - a maximum of four 4-port OC3/STM1 / 1-port OC12/STM4 Adapter cards can be installed in MDA slots 1 to 6 if DS1/E1 channelization is being used. DS0 and DS3/E3 channelization is not supported on the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card.
 - a maximum of six 6-port Ethernet 10Gbps Adapter cards can be installed in MDA slots 1 to 6. When installed in MDA slot 1 or 2, the 6-port Ethernet 10Gbps Adapter card supports a 10-Gb/s fabric rate. When installed in MDA slots 3 through 6, the aggregate fabric rate is 2.5 Gb/s.
- On a 7705 SAR-18 chassis:
 - a maximum of twelve 2-port OC3/STM1 Channelized Adapter cards can be installed in MDA slots 1 to 12 if DS3 channelization is being used. If DS1/E1 or DS0 (64 kb/s) channelization is being used, a maximum of four 2-port OC3/STM1 Channelized Adapter cards can be installed in MDA slots 1 to 12.
 - a maximum of twelve 4-port DS3/E3 Adapter cards can be installed in MDA slots 1 to 12 if DS3/E3 or DS1/E1 channelization is being used. If DS0 (64 kb/s) channelization is being used, a maximum of four 4-port DS3/E3 Adapter cards can be installed in MDA slots 1 to 12.
 - a maximum of six 4-port OC3/STM1 / 1-port OC12/STM4 Adapter cards can be installed in MDA slots 1 to 12 if DS1/E1 channelization is being used. DS0 and DS3/E3 channelization is not supported on the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card.
- The total number of channel groups that can be configured per card and per node is bound by release-specific system limits. For more information, please contact your Nokia technical support representative.



Note: Because the 6-port E&M Adapter card, 12-port Serial Data Interface card, 8-port Voice & Teleprotection card, 8-port FXO Adapter card, and 6-port FXS Adapter card support access mode only, and the Integrated Services card is a resource card that supports an access functionality only, for network applications, the maximum number of each of these adapter cards that can be installed in a 7705 SAR-8 chassis is 5, and the maximum number that can be installed in a 7705 SAR-18 chassis is 11.

3.1.2.3 Evolution of Ethernet Adapter Cards, Modules, and Platforms

The 7705 SAR hardware components have improved as technology has developed. [Table 2](#) lists the Ethernet adapter cards, modules, and platforms according to their generation. Second-generation (Gen-2) components have additional features, increased card memory and/or improved QoS mechanisms over first-generation (Gen-1) components. Similarly, third-generation (Gen-3) components improve upon second-generation components.

Table 2 Ethernet Adapter Card, Module, and Platform Generations

Generation	Card, Module, and Platform
First Generation	8-port Ethernet Adapter card
Second Generation	2-port 10GigE (Ethernet) Adapter card (v-port)
	2-port 10GigE (Ethernet) module (v-port) (for 7705 SAR-M)
	8-port Gigabit Ethernet Adapter card
	10-port 1GigE/1-port 10GigE X-Adapter card
	Packet Microwave Adapter card
	7705 SAR-A
	7705 SAR-Ax
	7705 SAR-H
	7705 SAR-Hc
	7705 SAR-M
	7705 SAR-W
	7705 SAR-Wx
	4-port SAR-H Fast Ethernet module
	6-port SAR-M Ethernet module

Table 2 Ethernet Adapter Card, Module, and Platform Generations

Generation	Card, Module, and Platform
Third Generation	6-port Ethernet 10Gbps Adapter card
	7705 SAR-X

3.1.2.4 Channelized Adapter Card Support

The following cards and modules support channelization down to the DS0 level:

- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- 12-port Serial Data Interface card
- 6-port E&M Adapter card
- 2-port OC3/STM1 Channelized Adapter card
- 4-port DS3/E3 Adapter card
- 8-port Voice & Teleprotection card
- 8-port FXO Adapter card
- 6-port FXS Adapter card
- 4-port T1/E1 and RS-232 Combination module

On the 16-port T1/E1 ASAP Adapter card, 32-port T1/E1 ASAP Adapter card, 2-port OC3/STM1 Channelized Adapter card, and 4-port DS3/E3 Adapter card (DS3 ports only), and on the T1/E1 ports of the 4-port T1/E1 and RS-232 Combination module, up to 24 channel groups are supported on a DS1 circuit and up to 32 channel groups on an E1 circuit.

The 12-port Serial Data Interface card supports a single channel group on a channelized V.35 circuit, RS-232 (also known as EIA/TIA-232) circuit, or X.21 circuit. The RS-232 ports on the 4-port T1/E1 and RS-232 Combination module also support a single channel group on a channelized RS-232 circuit.

The 6-port E&M Adapter card supports a single channel group on a channelized E&M voice interface.

The 8-port Voice & Teleprotection card supports a single channel group on a channelized G.703 (codirectional) circuit, an IEEE C37.94 teleprotection interface (TPIF) circuit, FXS circuit, or FXO circuit.

The 8-port FXO Adapter card supports a single channel group on an FXO circuit.

The 6-port FXS Adapter card supports a single channel group on an FXS circuit.

The 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card supports channelization at the DS1/E1 level only.

3.1.2.4.1 PPP Over Fractional T1/E1

The 16-port T1/E1 ASAP Adapter card, 32-port T1/E1 ASAP Adapter card, and the T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module each support fractional T1/E1 on a PPP channel group in network mode. Fractional T1/E1 allows one or more DS0 channels to be bundled together (up to the maximum bandwidth of the network link), allowing the customer to use only that portion of the link that is needed. This means that the PPP service can use a selected number of timeslots (octets) in the network T1 or E1 link, thus reducing the amount of T1 or E1 bandwidth that must be leased or purchased from the attached carrier. This leads to multiplexing efficiencies in the transport network.

Only one channel group can be configured per port. When the channel group is configured for ppp-auto encapsulation and network mode, all timeslots (channels) are automatically allocated to the channel group. The user can then configure the number of timeslots needed. Timeslots not selected cannot be used.

3.1.3 Configuring Ports

A port can be configured after the IOM is activated (the card slot and card type are designated) and the adapter card slot is preprovisioned with an allowed adapter card type.

The 7705 SAR supports the port types listed below:

- [Ethernet](#)
- [TDM](#)
- [DSL](#)
- [GNSS Receiver](#)
- [GPON](#)
- [Multilink Bundles](#)
- [IMA](#)
- [SONET/SDH](#)
- [Voice](#)

- [Microwave Link](#)

In addition, this section contains information on the following topics:

- [CLI Identifiers for Adapter Cards, Modules and Platforms](#)
- [Access, Network, and Hybrid Ports](#)

3.1.3.1 Ethernet

Ethernet ports are supported on the following cards, modules, and platforms:

- [6-port Ethernet 10Gbps Adapter Card](#)
- [8-port Ethernet Adapter Card](#)
- [8-port Gigabit Ethernet Adapter Card](#)
- [10-port 1GigE/1-port 10GigE X-Adapter Card](#)
- [2-port 10GigE \(Ethernet\) Adapter Card/Module](#)
- [Packet Microwave Adapter Card](#)
- [4-port SAR-H Fast Ethernet Module](#)
- [6-port SAR-M Ethernet Module](#)
- [7705 SAR-A](#)
- [7705 SAR-Ax](#)
- [7705 SAR-H](#)
- [7705 SAR-Hc](#)
- [7705 SAR-M](#)
- [7705 SAR-W](#)
- [7705 SAR-Wx](#)
- [7705 SAR-X](#)

3.1.3.1.1 6-port Ethernet 10Gbps Adapter Card

The 6-port Ethernet 10Gbps Adapter card has four SFP ports for 1-Gb/s fiber or copper SFP transceivers and two SFP+ ports for 10-Gb/s fiber or copper SFP+ transceivers. The card also supports synchronous Ethernet timing. The 6-port Ethernet 10Gbps Adapter card is designed to complement or replace the 8-port Ethernet Adapter card or the 8-port Gigabit Ethernet Adapter card in situations where greater processing power and higher throughput capacity are required.

The ports and features on the 6-port Ethernet 10Gbps Adapter card are identical to the ports and features on the 8-port Gigabit Ethernet Adapter card, version 3, except that the 6-port Ethernet 10Gbps Adapter card uses only 4-priority schedulers for QoS instead of 4-priority or 16-priority schedulers.

3.1.3.1.2 8-port Ethernet Adapter Card

The 8-port Ethernet Adapter card (the 7705 SAR-18 only supports version 2) has six RJ-45 ports for 10/100Base-T (Ethernet and Fast Ethernet) connections. The card also has two SFP ports for fiber or copper SFPs. Fast Ethernet and Gigabit (100 Mb/s and 1000 Mb/s) fiber connections and 10/100/1000Base-T copper connections are supported. This variety of connections enables the 8-port Ethernet Adapter card to be connected to different devices at the customer site, including wireless base stations, DSL modems, microwave boxes, and other auxiliary equipment. As well, with fiber connections, the adapter card can be directly connected to the Metro Ethernet Provider (MEP) central office. Version 2 of the 8-port Ethernet Adapter card also supports synchronous Ethernet timing.

3.1.3.1.3 8-port Gigabit Ethernet Adapter Card

The 8-port Gigabit Ethernet Adapter card has eight SFP ports for fiber or copper SFPs. The card supports dual rate (100 Mb/s and 1000 Mb/s) and Gigabit (1000 Mb/s) fiber connections and 10/100/1000Base-T copper connections. The card also supports synchronous Ethernet timing. The 8-port Gigabit Ethernet Adapter card is designed to complement or replace the 8-port Ethernet Adapter card in situations where greater processing power and higher throughput capacity are required.

There are three versions of the 8-port Gigabit Ethernet Adapter card. Version 1 and version 2 are identical except that version 2 provides larger table space for FIBs, ACLs, and so on. Version 2 also supports the full IPv6 subnet range for IPv6 static routes and interface IP addresses. The static route range is from /1 to /128, and the default route is ::/0. Supported interface IP address prefixes are from /4 to /127, and /128 on system or loopback interfaces. Version 3 is identical to version 2 except that it is equipped with a hardware-based encryption engine to support features such as IPSec.

Higher limits and full subnet ranges are supported only when all the adapter cards in a particular node are equipped with hardware for larger table support.

Gigabit Ethernet optical ports offer significant advantages over fast Ethernet ports, even where lower-speed services are currently offered. With Gigabit Ethernet, service providers have the opportunity to standardize access infrastructure, ensure that capacity is available to accommodate growing bandwidth requirements, and minimize the operational costs associated with future service upgrades to hardware and software.

3.1.3.1.4 10-port 1GigE/1-port 10GigE X-Adapter Card

There are two versions of the 10-port 1GigE/1-port 10GigE X-Adapter card. Both versions are identical except that version 2 is equipped with a hardware-based encryption engine to support features such as IPSec.

When the 10-port 1GigE/1-port 10GigE X-Adapter card (supported only on the 7705 SAR-18) is configured in 10-port GigE mode, 10 SFP ports are available for fiber SFP transceivers. In this mode, the card supports dual-rate (100 Mb/s and 1000 Mb/s) and Gigabit (1000 Mb/s) fiber connections. The card also supports synchronous Ethernet timing.

When the 10-port 1GigE/1-port 10GigE X-Adapter card is configured in 1-port GigE mode, only one SFP+ (port 1) of the 10 ports is active and available for use with fiber SFP+ transceivers. The card supports 10-Gb/s fiber connections. The card also supports synchronous Ethernet timing. The 1-port GigE mode is designed for use in situations where greater processing power and higher throughput capacity are required.

The 10-port 1GigE/1-port 10GigE X-Adapter card also provides larger table space for FIBs, ACLs, and so on. The card also supports the full IPv6 subnet range for IPv6 static routes and interface IP addresses. The static route range is from /1 to /128, and the default route is ::/0. Supported interface IP address prefixes are from /4 to /127, and /128 on system or loopback interfaces.

Higher limits and full subnet ranges are supported only when all the adapter cards in a particular node are equipped with hardware for larger table support.

3.1.3.1.5 2-port 10GigE (Ethernet) Adapter Card/Module

The 2-port 10GigE (Ethernet) Adapter card/module is used to connect to and from access rings carrying a high concentration of traffic. [Table 3](#) lists the maximum number of cards or modules that are supported on each platform. A single card can be installed in the 7705 SAR-8 and the 7705 SAR-18; however, it is strongly recommended that a minimum of two cards be installed for redundancy.

Table 3 Maximum Number of Cards/Modules Supported in Each Chassis

Chassis	Maximum Number of Cards or Modules
7705 SAR-8 with CSMv2	Up to four cards
7705 SAR-18	Up to six cards
7705 SAR-M	One module

The 2-port 10GigE (Ethernet) Adapter card/module has two small form-factor pluggable (XFP) ports on its faceplate. The two XFP ports are for 10-Gigabit Ethernet XFPs. The card provides high processing power and throughput capacity and operates at 10 Gb/s for Ethernet ports and 2.5 Gb/s for the virtual port (v-port).

The 2-port 10GigE (Ethernet) Adapter card provides larger table space for FIBs, ACLs, and so on. The card also supports the full IPv6 subnet range for IPv6 static routes and interface IP addresses on the v-port. The supported range for statically provisioned or dynamically learned routes is from /1 to /128. Supported interface IP address prefixes are from /4 to /127, and /128 on system or loopback interfaces.

The 2-port 10GigE (Ethernet) module supports IPv6 on the v-port. The supported range for statically provisioned or dynamically learned routes is from /1 to /64 or is /128 (indicating a host route). Supported interface IP address prefixes are from /4 to /64, and /128 on system or loopback interfaces.

The 2-port 10GigE (Ethernet) Adapter card/module supports LLDP on the Ethernet ports but not on the v-port.

3.1.3.1.6 Packet Microwave Adapter Card

The Packet Microwave Adapter card has two RJ-45 ports (ports 1 and 2) and six SFP ports (ports 3 through 8). All ports provide 10/100/1000 Mb/s connections (when connected to an MPR-e radio, they are always in Gigabit Ethernet (1-Gb/s) mode). Ports 1 through 4 support Microwave Awareness (MWA) and Ethernet/IP/MPLS networking; ports 5 through 8 support Ethernet/IP/MPLS networking only.

All Gigabit Ethernet ports provide the same networking feature capability as the 8-port Gigabit Ethernet Adapter card. For frequency synchronization, synchronous Ethernet and SSM are the mechanisms that are applied when using optical 1000Base-SX to connect to an MPR-e radio. When using electrical 1000Base-T to connect the Packet Microwave Adapter card and an MPR-e radio, Proprietary Clock Recovery (PCR) is used (a copper SFP is mandatory on ports 3 and 4).

3.1.3.1.7 4-port SAR-H Fast Ethernet Module

The 4-port SAR-H Fast Ethernet module has four RJ-45 Fast Ethernet ports (10/100 Mb/s) on its faceplate. Any functionality supported on the 7705 SAR-H Ethernet ports is also supported on the 4-port SAR-H Fast Ethernet module, with the exception of hierarchical QoS (H-QoS) functionality and hybrid mode.

3.1.3.1.8 6-port SAR-M Ethernet Module

The 6-port SAR-M Ethernet module has six Ethernet ports:

- two SFP Fast Ethernet ports (10/100 Mb/s) (ports 1 and 2)
- two XOR (combination) SFP/RJ point five Gigabit Ethernet ports (10/100/1000 Mb/s) (ports 3a/3b and 4a/4b)
- two PoE-capable RJ point five copper Gigabit Ethernet ports (10/100/1000 Mb/s) (ports 5 and 6)

Ports 5 and 6 can each support Power over Ethernet (PoE). Port 5 can also support PoE+, but if it is configured for PoE+, then port 6 cannot support PoE power.

Any functionality supported on the 7705 SAR-M Ethernet ports is also supported on the 6-port SAR-M Ethernet module, with the exception of half-duplex mode (all ports) and hybrid mode (Fast Ethernet ports only).

3.1.3.1.9 7705 SAR-A

The 7705 SAR-A has two variants with fixed physical configurations. One variant supports both Ethernet and T1/E1 ports. The other variant supports only Ethernet ports. Both variants of the 7705 SAR-A have 12 Ethernet ports:

- four XOR (combination) Gigabit Ethernet ports, either 10/100/1000Base-T RJ-45 (ports 1A to 4A) or 100/1000 Mb/s SFP (ports 1B to 4B)
- four SFP Gigabit Ethernet ports (100/1000 Mb/s) (ports 5 to 8)

- four RJ-45 Fast Ethernet ports (10/100 Mb/s) (ports 9 to 12)

3.1.3.1.10 7705 SAR-Ax

The 7705 SAR-Ax has a fixed physical configuration that has 12 Ethernet ports:

- four XOR (combination) Gigabit Ethernet ports, either 10/100/1000Base-T RJ-45 (ports 1A to 4A) or 100/1000 Mb/s SFP (ports 1B to 4B)
- eight SFP Gigabit Ethernet ports (100/1000 Mb/s) (ports 5 to 12)

3.1.3.1.11 7705 SAR-H

The 7705 SAR-H has a fixed physical configuration that has eight Ethernet ports:

- two SFP Gigabit Ethernet ports (10/100/1000 Mb/s) (ports 1 and 2)
- two XOR (combination) RJ-45/SFP Gigabit Ethernet ports (10/100/1000 Mb/s) (ports 3 and 4)
- four PoE-capable RJ-45 Gigabit Ethernet ports (10/100/1000 Mb/s) (ports 5 to 8)

The 7705 SAR-H also has two module slots.

If a PoE Power Supply is connected, it increases the number of Ethernet ports that can supply PoE to a connected device.

3.1.3.1.12 7705 SAR-Hc

The 7705 SAR-Hc has a fixed physical configuration that has six Ethernet ports:

- two SFP Gigabit Ethernet ports (10/100/1000 Mb/s) (ports 1 and 2)
- two Gigabit Ethernet RJ-45 ports (10/100/1000 Mb/s) (ports 3 and 4)
- two PoE-capable RJ-45 Gigabit Ethernet ports (10/100/1000 Mb/s) (ports 5 and 6)

3.1.3.1.13 7705 SAR-M

The 7705 SAR-M has a fixed physical configuration that has four variants. All variants of the 7705 SAR-M have seven Ethernet ports:

- four SFP Gigabit Ethernet ports (10/100/1000 Mb/s) (ports 1 to 4)
- three Gigabit Ethernet RJ-45 ports (10/100/1000 Mb/s) (ports 5 to 7)

Two variants of the 7705 SAR-M also have a module slot.

3.1.3.1.14 7705 SAR-W

The 7705 SAR-W has a fixed physical configuration that has five Ethernet ports:

- three SFP Gigabit Ethernet ports (10/100/1000 Mb/s) (ports 1 to 3)
- two PoE+ capable Gigabit Ethernet RJ-45 ports (10/100/1000 Mb/s) (ports 4 and 5)

3.1.3.1.15 7705 SAR-Wx

The 7705 SAR-Wx has six variants with fixed physical configurations that provide the following Ethernet interfaces.

Two variants have five Gigabit Ethernet ports:

- three SFP Gigabit Ethernet ports (10/100/1000 Mb/s) (ports 1 to 3)
- two Gigabit Ethernet RJ-45 ports (10/100/1000 Mb/s) (ports 4 and 5)

Two variants have five Gigabit Ethernet ports:

- three SFP Gigabit Ethernet ports (10/100/1000 Mb/s) (ports 1 to 3)
- one Gigabit Ethernet RJ-45 port (10/100/1000 Mb/s) (port 4)
- one PoE+ Gigabit Ethernet RJ-45 port (10/100/1000 Mb/s) (port 5)

Two variants have four Gigabit Ethernet ports:

- three SFP Gigabit Ethernet ports (10/100/1000 Mb/s) (ports 1 to 3)
- one Gigabit Ethernet RJ-45 port (10/100/1000 Mb/s) (port 4)

3.1.3.1.16 7705 SAR-X

The 7705 SAR-X has a fixed physical configuration that has 14 Ethernet ports:

- four XOR (combination) RJ-45/SFP Gigabit Ethernet ports (10/100/1000 Mb/s) (ports 2/1A, 2/2A, 3/1A, 3/2A for RJ-45 and 2/1B, 2/2B, 3/1B, 3/2B for SFP)
- eight SFP Gigabit Ethernet ports (10/100/1000 Mb/s) (ports 2/3 to 2/6 and 3/3 to 3/6)
- two SFP+ 10-Gigabit Ethernet ports (ports 2/7 and 3/7)

3.1.3.2 TDM

TDM ports are supported on the following cards, modules, and platforms:

- [16-port T1/E1 ASAP Adapter Card](#)
- [32-port T1/E1 ASAP Adapter Card](#)
- [2-port OC3/STM1 Channelized Adapter Card](#)
- [4-port OC3/STM1 / 1-port OC12/STM4 Adapter Card](#)
- [4-port DS3/E3 Adapter Card](#)
- [8-port Voice & Teleprotection Card](#)
- [12-port Serial Data Interface Card](#)
- [4-port T1/E1 and RS-232 Combination Module](#)
- [7705 SAR-A](#)
- [7705 SAR-Hc](#)
- [7705 SAR-M](#)
- [7705 SAR-X](#)

3.1.3.2.1 16-port T1/E1 ASAP Adapter Card

There are two versions of the 16-port T1/E1 ASAP Adapter card. The 7705 SAR-18 only supports version 2.

Channelization is supported down to the DS0 level. To change port types, all ports must first be shut down. The ports can be configured for DS1 (T1) or E1 operation. All ports on the card must be either T1 or E1; there cannot be a mix of the two types. When the first port is configured on a card, all other ports on the card must be set to the same type.

The 16-port T1/E1 ASAP Adapter card supports fractional T1/E1 on network ports configured for PPP. Fractional T1/E1 allows a portion of the link to be used for traffic (up to the full link bandwidth).

DS1 ports on the 16-port T1/E1 ASAP Adapter card, version 2, can be configured for either B8ZS (bipolar with eight-zero substitution) zero code suppression or AMI (alternate mark inversion). B8ZS and AMI are line coding techniques.

3.1.3.2.2 32-port T1/E1 ASAP Adapter Card

On the 32-port T1/E1 ASAP Adapter card, channelization is supported down to the DS0 level. To change port types, all ports must first be shut down. The ports can be configured for DS1 (T1) or E1 operation. All ports on the card must be either T1 or E1; there cannot be a mix of the two types. When the first port is configured on a card, all other ports on the card must be set to the same type.

The 32-port T1/E1 ASAP Adapter card supports fractional T1/E1 on network ports configured for PPP. Fractional T1/E1 allows a portion of the link to be used for traffic (up to the full link bandwidth).

DS1 ports on the card can be configured for either B8ZS (bipolar with eight-zero substitution) zero code suppression or AMI (alternate mark inversion). B8ZS and AMI are line coding techniques.

3.1.3.2.3 2-port OC3/STM1 Channelized Adapter Card

On the 2-port OC3/STM1 Channelized Adapter card, channelization is supported down to the DS0 level. To change port types, all ports must first be shut down. The ports can be configured for DS1 (T1) or E1 channelization. All ports on the card must be either SONET or SDH; there cannot be a mix of the two types. When the first port is configured on a card, all other ports on the card must be set to the same type.

The 2-port OC3/STM1 Channelized Adapter card also supports DS3 channelization.

3.1.3.2.4 4-port OC3/STM1 / 1-port OC12/STM4 Adapter Card

The 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card can be configured to be in 4-port OC3/STM1 mode or 1-port OC12/STM4 mode (using the **mda-mode** command).

When the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card is configured in 4-port OC3/STM1 mode, four SFP ports are available for optical and electrical SFP transceivers. In this mode, the card supports OC3 SONET or STM1 SDH transmission.

When the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card is configured in 4-port OC3/STM1 mode, channelization is supported down to the DS1 level. To change port types, all ports must first be shut down. The ports can be configured for DS1 (T1) or E1 channelization in access mode, or PPP/MLPPP or POS in network mode. All ports on the card must be either SONET or SDH; there cannot be a mix of the two types. When the first port is configured on a card, all other ports on the card must be set to the same type. Switching between port types causes the adapter card to reset.

When the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card is configured in 1-port OC12/STM4 mode, SFP port 1 is available for optical SFP transceivers. Ports 2 through 4 are not available. In this mode, the card supports OC12 SONET and STM4 SDH transmission. The 1-port OC12/STM4 mode is designed for use in situations where greater bandwidth is required on a single port.

3.1.3.2.5 4-port DS3/E3 Adapter Card

The 4-port DS3/E3 Adapter card has four TDM DS3/E3 ports. The port type must be configured to be either DS3 or E3. Each DS3 port can be clear channel or channelized down to DS0 (64 kb/s). E3 ports can be clear channel only. Once the first port type has been configured, all other ports on the same 4-port DS3/E3 Adapter card must be set to the same type.

To change between types, the ports must first be deleted. DS3 ports provide B3ZS (bipolar with three-zero substitution) zero code suppression and E3 ports provide HDB3 (high density bipolar of order 3) zero code suppression. B3ZS and HDB3 zero code suppression are line coding techniques.

Channelization is supported down to the DS0 level (for DS3 ports only). To change port types, all ports must first be shut down. The ports can be configured for DS1 (T1) or E1 operation. All ports on the card must be either T1 or E1; there cannot be a mix of the two types. When the first port is configured on a card, all other ports on the card must be set to the same type.

3.1.3.2.6 8-port Voice & Teleprotection Card

On the 8-port Voice & Teleprotection card, channelization is supported down to the DS0 level. To change port types, all ports must first be shut down. The ports can be configured for DS1 (T1) or E1 operation. All ports on the card must be either T1 or E1; there cannot be a mix of the two types. When the first port is configured on a card, all other ports on the card must be set to the same type.

Channelization is supported on the two codirectional G.703 ports and two IEEE C37.94 teleprotection interface ports.

3.1.3.2.7 12-port Serial Data Interface Card

The 12-port Serial Data Interface card has four connectors, which support three serial data ports each. Each port grouping may be configured for V.35, RS-232, or X.21 operation. When a port has been configured for a specific interface type, the other two ports in that same grouping can only be configured for the same type.

The card also supports an RS-530 interface with the use of an adapter cable that connects to a DB15 connector on the front of the X.21 distribution panel. There is no configuration specifically for the RS-530 interface; configuration is done in X.21 mode and applies to the RS-530 interface when it is physically enabled through hardware.

All X.21 functionality is available on the RS-530 interface, except that only DCE operation is supported for RS-530. However, because X.21 does not support all the control leads available for RS-530, only a subset of the RS-530 control leads are supported.

Channelization on the 12-port Serial Data Interface card is supported down to the DS0 level.

3.1.3.2.8 4-port T1/E1 and RS-232 Combination Module

T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module (supported on the 7705 SAR-H) support channelization down to the DS0 level. To change port types, all ports must first be shut down. The ports can be configured for DS1 (T1) or E1 operation. All ports on the module must be either T1 or E1; there cannot be a mix of the two types. When the first port is configured on a module, all other ports on the card must be set to the same type.

3.1.3.2.9 7705 SAR-A

The 7705 SAR-A has two variants with fixed physical configurations. One variant supports both Ethernet and T1/E1 ports. The other variant supports only Ethernet ports. The variant that supports T1/E1 ports includes eight RJ-45 T1/E1 ports. All ports must be configured as either T1 or E1 ports; a mix of T1 and E1 ports is not allowed.

DS1 (T1) ports on the chassis can be configured for either B8ZS (bipolar with eight-zero substitution) zero code suppression or AMI (alternate mark inversion). B8ZS and AMI are line coding techniques.

3.1.3.2.10 7705 SAR-Hc

The 7705 SAR-Hc has a fixed physical configuration that includes two RS-232 RJ-45 ports. The chassis also includes Gigabit Ethernet/Ethernet support via SFP and RJ-45 ports.

3.1.3.2.11 7705 SAR-M

The 7705 SAR-M has a fixed physical configuration that has four variants. Two variants have 16 RJ-45 T1/E1 ports. All ports must be configured as either T1 or E1 ports; a mix of T1 and E1 ports is not allowed.

DS1 (T1) ports on the chassis can be configured for either B8ZS (bipolar with eight-zero substitution) zero code suppression or AMI (alternate mark inversion). B8ZS and AMI are line coding techniques.

3.1.3.2.12 7705 SAR-X

The 7705 SAR-X has a fixed physical configuration that provides TDM pseudowire services via eight T1/E1 RJ-45 ports.

3.1.3.3 DSL

The 6-port DSL Combination module and the 8-port xDSL module (supported on the 7705 SAR-M), and two variants of the 7705 SAR-Wx support DSL.

The 6-port DSL Combination module has six RJ-11 ports on its faceplate. Four of the RJ-11 ports support G.SHDSL.bis pairs, and two RJ-11 ports support xDSL operating in ADSL2,ADSL2+, or VDSL2 mode with no intermixing of DSL types.

The 8-port xDSL module has eight RJ-11 ports on its faceplate that support ADSL2, ADSL2+, or VDSL2 mode with no intermixing of DSL types.

The 7705 SAR-M views the Ethernet link on a DSL module as an Ethernet port. Any services on the 7705 SAR that are supported on an Ethernet port are also supported on the Ethernet link on a DSL module.

Two variants of the 7705 SAR-Wx support one 4-pair xDSL port.

3.1.3.4 GNSS Receiver

The 7705 SAR-H GPS Receiver module is equipped with a GPS RF port for retrieval and recovery of GPS and GLONASS signals. The 7705 SAR-Ax and some variants of the 7705 SAR-Wx are equipped with an integrated GNSS receiver and a GNSS RF port for retrieval and recovery of GPS and GLONASS signals.

The GNSS Receiver card installed in the 7705 SAR-8 or 7705 SAR-18 is equipped with a GNSS RF port for retrieval and recovery of both GPS and GLONASS signals.



Note: GLONASS-only signal recovery is not supported in this release.

3.1.3.5 GPON

The GPON module is a single-port optical network terminal (ONT) that integrates passive optical network (PON) capabilities into the 7705 SAR-M. The GPON module serves as an Ethernet Layer 2 connection point for receiving data from and transmitting data into a GPON network.

The GPON module connects to the 7705 SAR-M as a Gigabit Ethernet port. From an operational perspective, the 7705 SAR-M views the module as one of its Ethernet ports.

3.1.3.6 Multilink Bundles

A multilink bundle is a collection of channels on channelized ports that physically reside on the same adapter card. Multilink bundles are used by providers who offer either bandwidth-on-demand services or fractional bandwidth (DS3) services. Multilink bundles are supported over PPP channels (MLPPP). All member links of an MLPPP group must be of the same type (either E1 or DS1).

The following cards, modules, and platforms support multilink bundles:

- T1/E1 ports on the 7705 SAR-A (variants with T1/E1 ports)
- T1/E1 ports on the 7705 SAR-M (variants with T1/E1 ports)
- T1/E1 ports on the 7705 SAR-X

The following must have all member links of an MLPPP bundle configured on the same card or module:

- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module (on 7705 SAR-H)

The following must have all member links of an MLPPP bundle configured on the same card or module, and on the same port:

- 2-port OC3/STM1 Channelized Adapter card
- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card

3.1.3.7 IMA

The 16-port T1/E1 ASAP Adapter card, 32-port T1/E1 ASAP Adapter card, and the 2-port OC3/STM1 Channelized Adapter card support Inverse Multiplexing over ATM (IMA). IMA is a standard developed to address the increasing need for bandwidth greater than the DS1 or E1 link speeds (1.544 or 2.048 Mb/s, respectively) but less than higher link speeds such as DS3 (44.736 Mb/s). IMA combines the transport bandwidth of multiple DS1 or E1 channels in a logical link (called an IMA group) to provide scalable bandwidth.

3.1.3.8 SONET/SDH

The 4-port OC3/STM1 Clear Channel Adapter card has four hot-pluggable, SFP-based ports that can be independently configured to be SONET (OC3) or SDH (STM1).

The 2-port OC3/STM1 Channelized Adapter card has two hot-pluggable, SFP-based ports that can be configured to be SONET (OC3) or SDH (STM1). All ports on the 2-port OC3/STM1 Channelized Adapter card must be of the same type (either SONET or SDH).

The 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card has four hot-pluggable, SFP-based ports that can be configured to be SONET (OC3 or OC12) or SDH (STM1 or STM4). The card can be configured to be in either 4-port mode or 1-port mode (using the **mda-mode** command). In 4-port mode, all four ports can be configured as OC3 or STM1. In 1-port mode, only port 1 can be configured as OC12 or STM4. All ports on the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card must be of the same type (either SONET or SDH).

3.1.3.9 Voice

Voice ports are supported on the following cards:

- [6-port E&M Adapter Card](#)
- [8-port Voice & Teleprotection Card](#)
- [8-port FXO Adapter Card](#)
- [6-port FXS Adapter Card](#)

3.1.3.9.1 6-port E&M Adapter Card

The 6-port E&M Adapter card has six RJ-45 ports that support the transport of an analog voiceband signal between two analog devices over a digital network. The analog signals are converted into a 64 kb/s digital Pulse Code Modulation (PCM) format using either Mu-Law (North America) or A-Law (Rest of World) companding. The type of companding is selectable on a per-card basis. Companding conversion (that is, Mu-Law to A-Law or vice versa) is not supported.

The signaling type is selectable on a per-card basis depending on companding type. When A-Law companding is configured, the signaling type is automatically type V. When Mu-Law companding is configured, all signaling types can be selected; however, the only supported configurations are both ends of the connection operating in the same mode (for example, Type I to Type I) or one end operating in Type I mode and the other in Type V mode. The default signaling type for Mu-Law is Type I.

Each voice port can be configured to operate in either a two-wire or four-wire (default) mode. The ports (in groups of three – ports 1 to 3 and ports 4 to 6) can also be configured to operate in transmission-only mode, which provides a four-wire audio path with no signaling. A transmit and receive transmission level point (the analog-to-digital decibel level) can be configured for each port. See [Table 4](#) for the signaling type, companding law and audio wires configuration options on the 6-port E&M Adapter card.

Table 4 Configuration Options for the 6-port E&M Adapter Card

Signaling Type	Companding Type	Number of Wires
Type I, Type II, Type V	Mu-Law	Two-wire or four-wire
Type V	A-Law	Two-wire or four-wire
Transmission-only (no signaling)	Mu-Law or A-Law	Four-wire

3.1.3.9.2 8-port Voice & Teleprotection Card

The 8-port Voice & Teleprotection card supports the transport of an analog voiceband signal between two analog devices over a digital network

The card has two FXS RJ-45 ports and two FXO RJ-45 ports that support analog voiceband signals. The analog signals are converted into a 64 kb/s digital Pulse Code Modulation (PCM) format using either Mu-Law (North America) or A-Law (Rest of World) companding. The type of companding is selectable on a per-card basis. Companding conversion (that is, Mu-Law to A-Law or vice versa) is not supported.

The signaling type is selectable at the port level on a per-port basis depending on companding type.

FXO supports:

- 1511profile1 (1511 Loop Start) – A-Law companding
- 3600ls (Loop Start) – Mu-Law companding
- 3600re (Remote Extension) – A-Law companding

FXS supports:

- 3600plar (Private Line Automatic Ringdown) – A-Law and Mu-Law companding
- 1511plar – A-Law companding
- 1511profile1 (Loop Start) – A-Law companding
- 3600ls (Loop Start) – Mu-Law companding

- 3600re (Remote Extension) – A-Law companding

The default signaling type for FXO and FXS is 3600ls for Mu-Law companding and 3600re for A-Law companding.

3.1.3.9.3 8-port FXO Adapter Card

The 8-port FXO Adapter card supports the transport of an analog voiceband signal between two analog devices over a digital network

The card supports analog voiceband signals through four RJ-45 connectors that provide eight Foreign Exchange Office (FXO) ports, with two ports supported per connector. The analog signals are converted into a 64 kb/s digital Pulse Code Modulation (PCM) format using either Mu-Law (North America) or A-Law (Rest of World) companding. The type of companding is selectable on a per-card basis. Companding conversion (that is, Mu-Law to A-Law or vice versa) is not supported.

The signaling type is selectable at the port level on a per-port basis depending on companding type.

FXO supports:

- 1511profile1 (1511 loop start) – A-Law companding
- 3600ls (loop start) – Mu-Law companding
- 3600re (remote extension) – A-Law companding

The default signaling type is 3600ls for Mu-Law companding and 3600re for A-Law companding.

3.1.3.9.4 6-port FXS Adapter Card

The 6-port FXS Adapter card provides the capability of transporting a large number of voice circuits from one 7705 SAR location and terminating them at another 7705 SAR location that is connected to a PBX.

The card can also be configured for a Private Line Automatic Ringdown (PLAR) application, which is typically used outside of a PBX network, in order to provide a site-to-site or remote site-to-control center hotline functionality.

The card has six Foreign Exchange Subscriber (FXS) ports. Each port provides a short-reach, on-premises analog interface to an analog telephone set. After an incoming analog signal from a set is terminated on one of the FXS interfaces, it is converted into a digital 64 kb/s Pulse Code Modulation (PCM) format using either Mu-Law companding (North America) or A-Law companding (Rest of World).

The signal is then mapped into the E1 Channel Associated Signaling (CAS) transport scheme for A-Law or the T1 Robbed Bit Signaling (RBS) transport scheme for Mu-Law and transmitted using a Cpipe over any 7705 SAR network interface that supports the Cpipe service. For standard TDM, the network interface can be a T1/E1 or OC3/STM1 channelized interface. For MPLS, an Ethernet, T1/E1, OC3/STM1 channelized MLPPP, or OC3/STM1 clear channel interface can be used.

For a PBX application, the signal is terminated at the 7705 SAR hub location that is connected to a PBX by either an FXO interface or a T1/E1 interface (assuming the signaling formats are compatible). The FXO interface can be provided by either an 8-port FXO Adapter card or 8-port Voice & Teleprotection card that is installed in a 7705 SAR-8 or 7705 SAR-18 chassis at the 7705 SAR hub location.

For a PLAR application, the signal is terminated on an FXS interface on either another 6-port FXS Adapter card or an 8-port Voice & Teleprotection card that is installed in a 7705 SAR-8 or 7705 SAR-18 chassis that is located at a remote location, or terminated on a 3600 MainStreet or 1511 MAX. The connection is made over an E1 interface (3600 MainStreet or 1511 MAX) or a T1 interface (3600 MainStreet). A hotline call can originate from a 3600 MainStreet or 1511 MAX and terminate on an FXS interface on a 6-port FXS Adapter card (or on an FXS interface on an 8-port Voice & Teleprotection card).

[Table 5](#) shows the configuration options available on a 6-port FXS Adapter card. The companding law type is configured at the card level; the other options are configured at the voice port level.

Table 5 Configuration Options for the 6-port FXS Adapter Card

Configuration	Supported Options
Companding type	Mu-Law (the default) A-Law
Fault signaling	Idle (the default) Seized
Line balance	Nominal (the default) 800

Table 5 Configuration Options for the 6-port FXS Adapter Card

Configuration	Supported Options
Ring generation	16 Hz (the default) 20 Hz 25 Hz
Signaling type	3600 Private Line Automatic Ringdown (PLAR) (if Mu-Law or A-Law is used) 1511 PLAR (if A-Law is used) 1511 Profile1 (if A-Law is used) 3600 Loop Start (LS) (if Mu-Law is used; this is the default) 3600 Remote Extension (RE) (if A-Law is used; this is the default)
Transmission level point (TLP)	Rx: -7 dB to 0 dB (1-dB increments; the default is -3 dB) Tx: -4 dB to +3 dB (1-dB increments; the default is 0 dB)

3.1.3.10 Microwave Link

A microwave link can be configured as a virtual port object on a 7705 SAR-8 or 7705 SAR-18 in order to provide a basic microwave connection or the Microwave Awareness (MWA) capability to an MPR-e node

For more information, see [Microwave Link](#).

3.1.3.11 CLI Identifiers for Adapter Cards, Modules and Platforms

On the CLI, the adapter cards are referred to as MDAs. A port is identified using the format *slot/mda/port*, where *slot* identifies the IOM card slot ID (always 1), *mda* identifies the physical slot in the chassis for the adapter card, and *port* identifies the physical port on the adapter card; for example, 1/5/1. Adapter cards are configured at the card and port level.

On the fixed platforms, no configuration is required at the adapter card level in order to provision the ports.

On the CLI for the 7705 SAR-A, the *slot/mda* identifier for T1/E1 ports is 1/2 and for Ethernet ports is 1/1. T1/E1 ports are identified as 1/2/1 through 1/2/8 for the variant of the chassis with T1/E1 ports. Ethernet ports for both variants of the 7705 SAR-A are identified as 1/1/1 through 1/1/12.

On the CLI for the 7705 SAR-Ax, the *slot/mda* identifier for Ethernet ports is 1/1 and for the GNSS RF port is 1/2.

On the CLI for the 7705 SAR-H, the *slot/mda* identifier for Ethernet ports is 1/1. The chassis has two slots for modules (the 4-port T1/E1 and RS-232 Combination module, the GPS Receiver module, and the 4-port SAR-H Fast Ethernet module). On the CLI, the *slot/mda* identifier for a module installed in the first slot position is 1/2 and for a module installed in the second slot position is 1/3. Ethernet ports are identified as 1/1/1 through 1/1/8. Module ports are identified as 1/2/*port-num* for modules installed in the first slot position and 1/3/*port-num* for modules installed in the second slot position.

On the CLI for the 7705 SAR-Hc, the *slot/mda* identifier for Ethernet ports is 1/1 and for RS-232 ports is 1/2. Ethernet ports are identified as 1/1/1 through 1/1/6 and RS-232 ports are identified as 1/2/1 and 1/2/2.

On the CLI for the 7705 SAR-M, the *slot/mda* identifier for T1/E1 ports is 1/2 and for Ethernet ports is 1/1. For those variants of the chassis that have a module slot, the *slot/mda* identifier for the module on the CLI is 1/3. The 7705 SAR-M variants with module slots support the following modules: GPON module, 6-port DSL Combination module, 8-port xDSL module, CWDM OADM module, 2-port 10GigE (Ethernet) module, and 6-port SAR-M Ethernet module. T1/E1 ports are identified as 1/2/1 through 1/2/16 for those variants of the chassis with T1/E1 ports. Ethernet ports for all variants of the 7705 SAR-M are identified as 1/1/1 through 1/1/7. Those variants of the chassis that have module slots identify module ports as 1/3/*port-num*.

On the CLI for the 7705 SAR-W, the *slot/mda* identifier for the Ethernet ports is 1/1. Ethernet ports are identified as 1/1/1 through 1/1/5. The 7705 SAR-W also has an internal (virtual) port used for in-band Ethernet management connection. The virtual port is identified as **vrtl-mgmt** on the CLI and as 1/1/6 via SNMP.

On the CLI for the 7705 SAR-Wx, the *slot/mda* identifier for the Ethernet ports is 1/1 and 1/2 for the xDSL port. Ethernet ports for the Ethernet-only variant and the Ethernet and PoE+ variant are identified as 1/1/1 through 1/1/5. For the variant supporting Ethernet ports and an xDSL port, the Ethernet ports are identified as 1/1/1 through 1/1/4 and the DSL port is identified as 1/2/1 through 1/2/4.

On the CLI for the 7705 SAR-X, the *slot/mda* identifier is specified as 1 for T1/E1 ports and 2 or 3 for Ethernet ports. The port number is specified as a variable that can have a value from 1 to 8 for T1/E1 ports or 1 to 7 for Ethernet ports, depending on how the port is configured.

For the 16-port T1/E1 ASAP Adapter card, 32-port T1/E1 ASAP Adapter card, and 4-port DS3/E3 Adapter card, the *channel-group-id* identifies the DS1 or E1 channel group; for example, 1/5/1.20. For the 2-port OC3/STM1 Channelized Adapter card, the *channel-group-id* identifies the DS1, E1, or DS3 channel group. For the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card, the *channel-group-id* identifies the DS1 or E1 channel group. For the 12-port Serial Data Interface card, the *channel-group-id* identifies the V.35, RS-232, or X.21 channel group; only one channel group per port is supported on the card, so the format would be 1/1/1.1.

For the 6-port E&M Adapter card, the *channel-group-id* identifies the E&M voice channel group; only one channel group per port is supported on the card, so the format would be 1/1/1.1. For the 8-port Voice & Teleprotection card, the 8-port FXO Adapter card, and the 6-port FXS Adapter card, the *channel-group-id* identifies the DS0 channel group; only one channel group per port is supported on the card, so the format would be 1/1/1.1.

For the 4-port T1/E1 and RS-232 Combination module, the *channel-group-id* identifies the DS1 or E1 channel group for the T1/E1 ports (for example, 1/2/3.5) or the channel group for the RS-232 ports (for example, 1/2/2.1).

On the CLI for the 2-port 10GigE (Ethernet) Adapter card or 2-port 10GigE (Ethernet) module, for virtual-port configuration, an Ethernet port is identified as v-port.

The following output examples display the administrative and operational states of adapter cards for all platforms.

For the 7705 SAR-8 with a CSMv2:

```
ALU-1>show card state
=====
Card State
=====
```

Slot/ Id	Provisioned Type Equipped Type (if different)	Admin State	Operational State	Num Ports	Num MDA	Comments
1	iom-sar	up	up		6	
1/1	a12-sdiv2	up	provisioned	12		
1/2	a4-oc3	up	provisioned	4		
1/3	a16-chds1	up	provisioned	16		
1/4	a4-chds3	up	provisioned	4		
1/5	a8-eth	up	provisioned	8		
1/6	a2-choc3	up	provisioned	2		
A	csmv2-10g	up	up			Active
B	csmv2-10g	up	down			Standby

```
=====
ALU-1>#
```

For the 7705 SAR-18:

```
*A:ALU-1# show card state
```

```
=====
Card State
=====
Slot/   Provisioned Type           Admin Operational   Num   Num Comments
Id      Equipped Type (if different) State State           Ports MDA
-----
1       iom-sar                       up    up                       12
1/1     aux-alarm                     up    up
1/2     a8-ethv2                      up    up                       8
1/3     a8-ethv2                      up    up                       8
1/4     a8-ethv2                      up    provisioned             8
1/5     a8-ethv2                      up    provisioned             8
1/6     a32-chdslv2                   up    up                      32
1/7     a32-chdslv2                   up    up                      32
1/8     a8-pmc                        up    up                       8
1/9     mw-pic-2                     up    up                       2
1/10    a4-oc3                       up    provisioned             4
1/11    a4-chds3                     up    provisioned             4
1/12    a2-choc3                     up    provisioned             2
1/X1    x-10GigE                     up    provisioned             1
1/X2    x-10GigE                     up    provisioned             1
1/X3    x-10GigE                     up    provisioned             1
1/X4    x-10GigE                     up    provisioned             1
A       csm-10g                      up    up                       Active
B       csm-10g                      up    down                     Standby
=====
*A:ALU-1#
```

For the 7705 SAR-A:

```
*A:ALU-1# show card state
```

```
=====
Card State
=====
Slot/   Provisioned Type           Admin Operational   Num   Num Comments
Id      Equipped Type (if different) State State           Ports MDA
-----
1       iom-sar                       up    up                       2
1/1     i12-eth-xor                   up    up                      12
1/2     i8-chdsl                      up    up                       8
A       csm-2.5g                     up    up                       Active
=====
*A:ALU-1#
```

For the 7705 SAR-Ax:

```
*A:sar-Ax# show card state
=====
Card State
=====
Slot/  Provisioned Type          Admin Operational  Num   Num Comments
Id      Equipped Type (if different) State State          Ports MDA
-----
1       iom-sar                 up    up                2
1/1     i12-1gb-xor              up    up                12
1/2     i1-gnss                    up    up                1
A       csm-2.5g                 up    up                Active
=====
```

For the 7705 SAR-H:

```
*A:ALU-1# show card state
=====
Card State
=====
Slot/  Provisioned Type          Admin Operational  Num   Num Comments
Id      Equipped Type (if different) State State          Ports MDA
-----
1       iom-sar                 up    up                3
1/1     i8-1gb                   up    up                8
1/2     p4-combo                 up    up                4
1/3     p4-combo                 up    up                4
A       csm-2.5g                 up    up                Active
=====
*A:ALU-1#
```

For the 7705 SAR-Hc:

```
*A:ALU-1# show card state
=====
Card State
=====
Slot/  Provisioned Type          Admin Operational  Num   Num Comments
Id      Equipped Type (if different) State State          Ports MDA
-----
1       iom-sar                 up    up                2
1/1     i6-1gb                   up    up                6
1/2     i2-sdi                   up    up                2
A       csm-2.5g                 up    up                Active
=====
*A:ALU-1#
```

For the 7705 SAR-M:

```
*A:ALU-1# show card state
```

```
=====
Card State
=====
Slot/  Provisioned Type          Admin Operational  Num   Num Comments
Id      Equipped Type (if different) State State         Ports MDA
-----
1       iom-sar                  up    up              3
1/1     i7-1gb                    up    up              7
1/2     i16-chds1                   up    up             16
1/3     p1-GPON                    up    up
A       csm-2.5g                  up    up              Active
=====
*A:ALU-1#
```

For the 7705 SAR-W:

```
*A:ALU-1# show card state
```

```
=====
Card State
=====
Slot/  Provisioned Type          Admin Operational  Num   Num Comments
Id      Equipped Type (if different) State State         Ports MDA
-----
1       iom-sar                  up    up              1
1/1     i5-1gb                    up    up              6
A       csm-2.5g                  up    up              Active
=====
*A:ALU-1#
```

For a 7705 SAR-Wx Ethernet variant:

```
*A:ALU-1# show card state
```

```
=====
Card State
=====
Slot/  Provisioned Type          Admin Operational  Num   Num Comments
Id      Equipped Type (if different) State State         Ports MDA
-----
1       iom-sar                  up    up              1
1/1     i5-1gb-b                   up    up              5
A       csm-2.5g                  up    up              Active
=====
*A:ALU-1#
```

For a 7705 SAR-Wx Ethernet with xDSL variant:

```
*A:ALU-1# show card state
=====
Card State
=====
Slot/   Provisioned Type           Admin Operational   Num   Num  Comments
Id      Equipped Type (if different)  State  State           Ports MDA
-----
1       iom-sar                       up    up                2
1/1     i4-1gb-b                      up    up                4
1/2     i4-xdsl                       up    up                1
A       csm-2.5g                      up    up                Active
=====
*A:ALU-1#
```

For a 7705 SAR-X:

```
*A:ALU-1# show card state
=====
Card State
=====
Slot/   Provisioned Type           Admin Operational   Num   Num  Comments
Id      Equipped Type (if different)  State  State           Ports MDA
-----
1       iom-sar                       up    up                3
1/1     i8-chdsl-x                    up    up                8
1/2     i7-mix-eth                    up    up                7
1/3     i7-mix-eth                    up    up                7
A       csm-2.5g                      up    up                Active
=====
*A:ALU-1#
```

3.1.3.12 Access, Network, and Hybrid Ports

All ports must be set to access (customer-facing), network, or hybrid mode. When the mode is configured on a port, the appropriate encapsulation type must be configured to distinguish the services on the port or channel (for access mode), or to define the transport mode (for network mode).

For the 16-port T1/E1 ASAP Adapter card, version 2, 32-port T1/E1 ASAP Adapter card, and 4-port DS3/E3 Adapter card, the card must be enabled to support a set of software services before the encapsulation type is configured. This support is enabled using the **mda-mode** command (see the [mda-mode](#) command in the [Configuration Command Reference](#) section):

- access ports — configured for customer-facing traffic on which services are configured. If a Service Access Point (SAP) is to be configured on the port or channel, the port or channel must be configured as an access port or channel.

On the 16-port T1/E1 ASAP Adapter card, version 1, the encapsulation type can be ipcp, cem, or atm. The encapsulation type on the 16-port T1/E1 ASAP Adapter card, version 2, and the 32-port T1/E1 ASAP Adapter card can be ipcp, cem, atm, frame-relay, hdlc, or cisco-hdlc.

On the 12-port Serial Data Interface card, the encapsulation type can be cem, ipcp, frame-relay, hdlc, or cisco-hdlc. V.35 ports and X.21 ports at super-rate speeds (64 kb/s and above) support all of the above encapsulation types. RS-232 ports and X.21 ports operating at subrate speeds support only cem encapsulation.

On the 4-port T1/E1 and RS-232 Combination module, the encapsulation type for T1/E1 ports can be ipcp or cem. RS-232 ports operating at subrate speeds support only cem encapsulation.

On the 6-port E&M Adapter card, 8-port Voice & Teleprotection card, 8-port FXO Adapter card, and 6-port FXS Adapter card, the encapsulation type must be cem.

On the 8-port Ethernet Adapter card, the 8-port Gigabit Ethernet Adapter card, the 6-port Ethernet 10Gbps Adapter card, the 10-port 1GigE/1-port 10GigE X-Adapter card, the Packet Microwave Adapter card, the 4-port SAR-H Fast Ethernet module, the 6-port SAR-M Ethernet module, the xDSL ports on the 7705 SAR-Wx, and the Ethernet ports on all fixed platforms with Ethernet ports, the encapsulation type can be set as null, dot1q, or qinq.

Note:



- The 10-port 1GigE/1-port 10GigE X-Adapter card supports qinq only when it is in 10-port 1GigE mode.
- The Packet Microwave Adapter card supports qinq only when the port is not in mw-link mode.

On the 4-port OC3/STM1 Clear Channel Adapter card, the encapsulation type must be atm.

On the 4-port DS3/E3 Adapter card, the encapsulation type for DS3/E3 clear channel ports can be atm, cem, or frame-relay. The encapsulation type for DS3 channelized ports can be cem or frame-relay.

On the 2-port OC3/STM1 Channelized Adapter card, the encapsulation type can be ipcp, cem, or atm.

On the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card, the encapsulation type must be cem.

- network ports — configured for network-facing traffic. Network ports are used as uplinks for Ethernet, ATM, PPP, and TDM pseudowires.

On the Ethernet cards, the Packet Microwave Adapter card, the 2-port 10GigE (Ethernet) Adapter card, and 2-port 10GigE (Ethernet) module, the encapsulation type can be set as null or dot1q.



Note: QinQ encapsulation is not supported on a port in network mode.

The encapsulation type must be ppp-auto for PPP/MLPPP bundles on the following:

- T1/E1 ports on the 7705 SAR-A (variants with T1/E1 ports)
- T1/E1 ports on the 7705 SAR-M (variants with T1/E1 ports)
- T1/E1 ports on the 7705 SAR-X
- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- 2-port OC3/STM1 Channelized Adapter card
- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card
- T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module (on 7705 SAR-H)

Network PPP (encapsulation type ppp-auto) can be configured to use some with fractional ppp or all the timeslots on T1/E1 ports on the following cards:

- T1/E1 ports on the 7705 SAR-A (variants with T1/E1 ports)
- T1/E1 ports on the 7705 SAR-M (variants with T1/E1 ports)
- T1/E1 ports on the 7705 SAR-X
- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module (on 7705 SAR-H)

On the 4-port OC3/STM1 Clear Channel Adapter card, 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card, and 4-port DS3/E3 Adapter card, the encapsulation type must be ppp-auto. Fractional PPP is not supported on these cards; all timeslots of the DS1 will be used.

- hybrid ports — configured for access (customer-facing) and network-facing traffic. Hybrid ports can support access and network modes simultaneously over different VLANs. Within the span of a port, some of the VLANs can be in access mode and associated with SAPs for various services, while other VLANs can be in network mode and support any of the network-side operations, including label switching, IP forwarding (GRT IP routing), GRE SDPs, and so on.

The default modes are listed in [Table 6](#). All channel groups on a port must either be all access or all network channel groups; there cannot be a mix. When the first channel group is configured, all other channel groups on that port must be set to the same mode. To change modes, all channel groups must first be shut down.

Table 6 Default Port Mode per Adapter Card, Module, or Platform

Default Mode	Adapter Card, Module, or Platform
Network	2-port 10GigE (Ethernet) Adapter card 2-port 10GigE (Ethernet) module 6-port DSL Combination module 8-port xDSL module 10-port 1GigE/1-port 10GigE X-Adapter card GPON module

Table 6 **Default Port Mode per Adapter Card, Module, or Platform**

Default Mode	Adapter Card, Module, or Platform
Access	2-port OC3/STM1 Channelized Adapter card 4-port DS3/E3 Adapter card 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card 4-port OC3/STM1 Clear Channel Adapter card 4-port SAR-H Fast Ethernet module 4-port T1/E1 and RS-232 Combination module is access for the T1/E1 ports; the RS-232 ports operate in access mode only 6-port E&M Adapter card 6-port Ethernet 10Gbps Adapter card 6-port FXS Adapter card 6-port SAR-M Ethernet module 8-port Ethernet Adapter card 8-port FXO Adapter card 8-port Gigabit Ethernet Adapter card 8-port Voice & Teleprotection card 12-port Serial Data Interface card 16-port T1/E1 ASAP Adapter card 32-port T1/E1 ASAP Adapter card Auxiliary Alarm card CWDM OADM Adapter card GNSS Receiver card GPS Receiver module Integrated Services card Packet Microwave Adapter card Power Injector card 7705 SAR-A 7705 SAR-Ax 7705 SAR-H 7705 SAR-Hc 7705 SAR-M 7705 SAR-W 7705 SAR-Wx 7705 SAR-X

3.1.3.12.1 Rate Limiting

The 7705 SAR supports egress-rate limiting and ingress-rate limiting on Ethernet ports.

The egress rate is set at the port level in the **config>port>ethernet** context.

Egress-rate limiting sets a limit on the amount of traffic that can leave the port to control the total bandwidth on the interface. If the egress-rate limit is reached, the port applies backpressure on the queues, which stops the flow of traffic until the queue buffers are emptied. This feature is useful in scenarios where there is a fixed amount of bandwidth; for example, a mobile operator who has leased a fixed amount of bandwidth from the service provider.

The **ingress-rate** command configures a policing action to rate-limit the ingress traffic. Ingress-rate enforcement uses dedicated hardware for rate limiting; however, software configuration is required at the port level (ingress-rate limiter) to ensure that the network processor or the adapter card or port never receives more traffic than they are optimized for.

The configured ingress rate ensures that the network processor does not receive traffic greater than this configured value on a per-port basis. Once the ingress-rate value is reached, all subsequent frames are dropped. The ingress-rate limiter drops excess traffic without determining whether the traffic has a higher or lower priority.

3.1.3.12.2 Access Ports

Access ports on the following can be configured for PPP/MLPPP channel groups:

- 2-port OC3/STM1 Channelized Adapter card
- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module (on 7705 SAR-H)
- T1/E1 ports on the 7705 SAR-A (variants with T1/E1 ports)
- T1/E1 ports on the 7705 SAR-M (variants with T1/E1 ports)
- T1/E1 ports on the 7705 SAR-X

Customer IP traffic can be transported directly over PPP or MLPPP links. Access ports on the following can also be configured for TDM to transport 2G traffic from BTSs or ATM/IMA to transport 3G UMTS traffic from Node Bs:

- 2-port OC3/STM1 Channelized Adapter card

- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- T1/E1 ports on the 7705 SAR-M (variants with T1/E1 ports)

In access mode, PPP channels can be associated with $n \times$ DS0 channel groups. Although multiple PPP channel groups are supported per T1/E1 port, all the channel groups must be the same encapsulation type. For example, if one channel group on a given port is set for ipcp encapsulation, another channel group on the same port cannot be set to cem. If MLPPP channels are used, an MLPPP channel group fills up an entire DS1 or E1 link.

The 2-port OC3/STM1 Channelized Adapter card supports ipcp encapsulation of PPP/MLPPP packets for transport over an Ipipe.

The data ports on the 12-port Serial Data Interface card and the RS-232 ports on the 4-port T1/E1 and RS-232 Combination module provide transport between two data devices. Each data stream that is transported across the network can be mapped into a TDM pseudowire (Cpipe) for transport across an MPLS network. The other end can terminate either on another 7705 SAR or a multiplexer capable of terminating the pseudowire.

The 12-port Serial Data Interface card supports frame-relay encapsulation of data on V.35 and X.21 channel groups for transport over a frame relay pseudowire (Fpipe) or IP interworking pseudowire (Ipipe). The 12-port Serial Data Interface card also supports ipcp and cisco-hdlc encapsulation of PPP and Cisco HDLC packets, respectively, for transport over an Ipipe.

The 12-port Serial Data Interface card and the 4-port T1/E1 and RS-232 Combination module can also be part of a system architecture where a circuit originates on an SDI port on the 7705 SAR, transits over an MPLS network, and terminates on a 3600 MainStreet node connected to a 7705 SAR over a T1/E1 connection. In addition to the MPLS network functionality, the 12-port Serial Data Interface card and the 4-port T1/E1 and RS-232 Combination module can also operate in a TDM SAP-to-SAP mode where the other SAP can be another port on the 12-port Serial Data Interface card or on a T1/E1 ASAP card.

Access ports on the 8-port Ethernet Adapter card, 8-port Gigabit Ethernet Adapter card, 6-port Ethernet 10Gbps Adapter card, 10-port 1GigE/1-port 10GigE X-Adapter card, the Packet Microwave Adapter card, and the xDSL ports on the 7705 SAR-Wx, can transport traffic from sources such as e911 locators, site surveillance equipment, VoIP phones, and video cameras. The Ethernet traffic is transported over the PSN using Ethernet VLLs.



Note: For information on VLLs, refer to the 7705 SAR Services Guide, “VLL Services”.

A microwave link from a Packet Microwave Adapter card port in access mode can peer with user equipment such as a node B or MPR-e radio. The 7705 SAR-8 and the 7705 SAR-18 treat the microwave access link as a normal SAP into a service such as Epipe, Ipipe, or VPLS/VP RN.

Voice ports on the 6-port E&M Adapter card, 8-port Voice & Teleprotection card, and 8-port FXO Adapter card provide voiceband transmission between two analog devices over a digital network. A 7705 SAR-8 or 7705 SAR-18 terminates the voice circuit and then transmits the data over a TDM-based network interface (SAP-to-SAP) or an MPLS packet-based network interface (SAP-to-SDP). For standard TDM, a T1 or E1 interface is used to transmit the data across the network.

For MPLS, any network interface (that is, Ethernet, T1/E1 MLPPP, or OC3/STM1) can be used. The traffic originating from the 6-port E&M Adapter card, 8-port Voice & Teleprotection card, or 8-port FXO Adapter card can be mapped into a TDM pseudowire (Cpipe) for transport across the MPLS network. The 6-port E&M Adapter card, 8-port Voice & Teleprotection card, and 8-port FXO Adapter card support one TDM pseudowire per port.

The voice circuit can terminate on another 7705 SAR-8 or 7705 SAR-18 over the MPLS or T1/E1 TDM connection, on other TDM-capable equipment (such as a 3600 MainStreet node) over a T1/E1 TDM connection, or on other MPLS-capable equipment over an MPLS pseudowire emulation (PWE) connection. A 3600 MainStreet or 1511 MAX can also connect to an FXO port on the 8-port Voice & Teleprotection card.

Voice ports on a 6-port FXS Adapter card can be configured for a PBX application or a PLAR (hotline) application. For a PBX application, the voice circuits are terminated on an FXO interface at a 7705 SAR hub location that is connected to a PBX. The FXO interface can be provided by either an 8-port FXO Adapter card or 8-port Voice & Teleprotection card that is installed in a 7705 SAR-8 or 7705 SAR-18 chassis at the 7705 SAR hub location. For a PLAR application, voice circuits are terminated on an FXS interface on either another 6-port FXS Adapter card or an 8-port Voice & Teleprotection card that is installed in a 7705 SAR-8 or 7705 SAR-18 chassis located at a remote location, or terminated on a 3600 MainStreet or 1511 MAX. A hotline call can also originate from a 3600 MainStreet or 1511 MAX and terminate on an FXS interface on a 6-port FXS Adapter card (or on an FXS interface on an 8-port Voice & Teleprotection card).

SONET/SDH ports in access mode on a 4-port OC3/STM1 Clear Channel Adapter card can be configured for ATM (such as for 3G UMTS Node Bs).

The DS3/E3 clear channel access ports on the 4-port DS3/E3 Adapter card can be configured for ATM PW services (categories CBR, VBR-rt, VBR-nrt, UBR, and UBR+MCR), for TDM PW services to transport 2G traffic from BTSs, and for frame relay PW service.

Access ports on the 2-port OC3/STM1 Channelized Adapter card can be configured for TDM to transport 2G traffic from BTSs or ATM/IMA to transport 3G UMTS traffic from Node Bs. Access ports on the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card can only be configured for TDM.

All member links of the IMA group must reside on the same card. The 2G traffic is transported across the PSN encapsulated in a TDM VLL. The 3G traffic is transported using ATM VLLs.

For PPP/MLPPP channel groups, the encapsulation type must be ipcp. For Ethernet VLLs, the encapsulation type can be null, dot1q, or qinq. For TDM VLLs, the encapsulation type must be cem. For ATM VLLs, the encapsulation type must be atm.

H-QoS for Access Egress Ethernet Ports

To support hierarchical QoS (H-QoS) on second-generation Ethernet adapter cards, the 7705 SAR supports the configuration of one aggregate CIR rate for all the unshaped 4-priority access egress Ethernet SAPs on a port, thereby ensuring that all the unshaped SAPs can compete with the shaped SAPs on the port for fabric bandwidth. Use the **config>port>ethernet>access>egress>unshaped-sap-cir** command to set the aggregate CIR rate.

Third-generation (Gen-3) Ethernet adapter cards and platforms have 4-priority schedulers, and all SAPs are shaped SAPs. See [Table 2](#) for a list of first-, second-, and third-generation adapter cards, modules, and platforms. Refer to the “QoS for Gen-3 Adapter Cards and Platforms” section in the 7705 SAR Quality of Service Guide for more information on 4-priority schedulers for Gen-3 hardware.

Ports on the 4-port SAR-H Fast Ethernet module do not support H-QoS.

For more information on H-QoS and on shaped and unshaped Ethernet SAPs, refer to the “Per-SAP Aggregate Shapers (H-QoS)” section in the 7705 SAR Quality of Service Guide.

3.1.3.12.3 Network Ports

Network uplinks can be configured as standalone PPP ports, or MLPPP can be configured on T1/E1 ports or channels. All member links of an MLPPP group must be of the same type (either E1 or Ds1).

The following cards, modules, and platforms support multilink bundles:

- T1/E1 ports on the 7705 SAR-A (variants with T1/E1 ports)
- T1/E1 ports on the 7705 SAR-M (variants with T1/E1 ports)
- T1/E1 ports on the 7705 SAR-X

The following must have all member links of an MLPPP bundle configured on the same card or module:

- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module (on 7705 SAR-H)

The following must have all member links of an MLPPP bundle configured on the same card or module, and on the same port:

- 2-port OC3/STM1 Channelized Adapter card
- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card

Ethernet ports on the 8-port Ethernet Adapter card, 8-port Gigabit Ethernet Adapter card, 6-port Ethernet 10Gbps Adapter card, 10-port 1GigE/1-port 10GigE X-Adapter card, and Packet Microwave Adapter card can be configured for network mode. Ethernet uplinks can be used as a cost-effective alternative to T1/E1 links.

On the 2-port 10GigE (Ethernet) Adapter card and 2-port 10GigE (Ethernet) module, the Ethernet ports and the v-port can be configured for network mode only.

A microwave link from a Packet Microwave Adapter card port in network mode provides a network uplink to an MPR-e radio. The 7705 SAR-8 or 7705 SAR-18 treats the microwave link as a Gigabit Ethernet network link with MPLS always running over it. All standard MPLS/IP functions available on a network port or SDP are also available on the microwave link.

For network uplinks on the 4-port OC3/STM1 Clear Channel Adapter card and 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card, a clear channel port can be configured for POS to connect to the packet network. PPP can be enabled on a port by setting the encapsulation type to ppp-auto.

On the 4-port DS3/E3 Adapter card, a DS3/E3 clear channel port can be configured for PPP as the network uplink. The encapsulation type must be set to ppp-auto.

The 7705 SAR supports both copper and fiber uplinks.

Aggregate CIR for Unshaped VLANs on Network Egress Ethernet Ports

The 7705 SAR supports the configuration of one aggregate CIR rate for all the unshaped network egress Ethernet VLANs on a port, thereby ensuring that all the unshaped VLANs can compete with the shaped VLANs (that is, network interfaces) at the port level for egress bandwidth. Use the **config>port>ethernet>network>egress>unshaped-if-cir** command to set the aggregate CIR rate.



Note: The **unshaped-if-cir** command does not apply to Gen-3 Ethernet adapter cards and platforms, except for network egress in hybrid mode. In this case, the **shaper-if-cir** command applies.

For more information on shaped and unshaped Ethernet VLANs, refer to the “Per-VLAN Network Egress Shapers” and “QoS for Gen-3 Adapter Cards and Platforms” sections in the 7705 SAR Quality of Service Guide.

3.1.3.12.4 Hybrid Ports

Hybrid ports are supported on Ethernet ports, where they provide the capabilities and features of access and network mode ports on a per-VLAN basis. The following services support hybrid port functionality: Epipe PW, Ipipe PW, IP-VPN, VPLS, and IES.

For ingress traffic, QoS and traffic management on a hybrid port behaves in the same way for access and network port modes. Refer to the 7705 SAR Quality of Service Guide, “QoS for Hybrid Ports on Gen-2 Hardware” and “QoS for Gen-3 Adapter Cards and Platforms” for details.

Network VLANs on a hybrid port provide OAM down MEP support, as well as port loopback support (in line mode with latched timers only).

The following hardware supports hybrid ports:

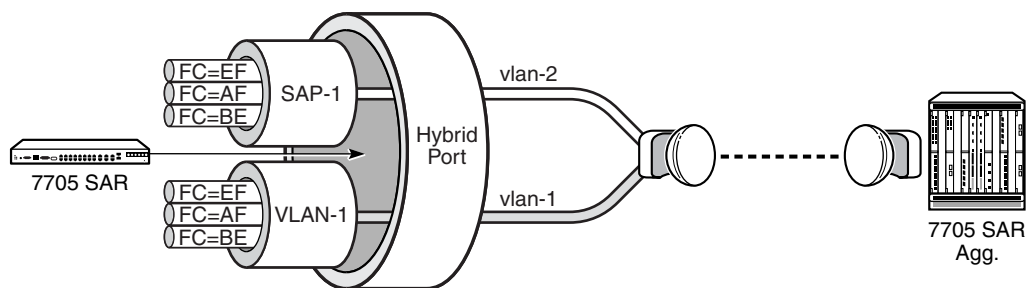
- 6-port SAR-M Ethernet module (except for the Fast Ethernet ports (ports 1 and 2))
- 6-port Ethernet 10Gbps Adapter card
- 8-port Gigabit Ethernet Adapter card
- 10-port 1GigE/1-port 10GigE X-Adapter card (only in 10-port 1GigE mode)
- Packet Microwave Adapter card (only in Ethernet port mode (not mw-link mode))

- 7705 SAR-A Ethernet ports (except for the Fast Ethernet ports (ports 9 to 12))
- 7705 SAR-Ax Ethernet ports
- 7705 SAR-M Ethernet ports
- 7705 SAR-H Ethernet ports
- 7705 SAR-Hc Ethernet ports
- 7705 SAR-W Ethernet ports
- 7705 SAR-Wx Ethernet ports
- 7705 SAR-X Ethernet ports

In some scenarios, combining the access and network capabilities under the same port is beneficial. A typical scenario is shown in [Figure 1](#), where a single port hosts both access-side services and a traffic management model together with network-side IP/MPLS routing and switching capabilities simultaneously.

In this scenario, a network interface is configured to ensure connectivity between the cell site 7705 SAR and the aggregation site 7705 SAR. The network interface is used for all IP/MPLS traffic and is bound to VLAN-1. Another VLAN (VLAN-2) is configured to bind the management traffic of a microwave radio (an MPR-e) to an access-side service such as an Ethernet PW or VPLS. For security reasons, many mobile operators prefer to transport management traffic of network elements under a service construct as opposed to basic GRT-based routing. To accommodate this preference, an access-side service and a network interface can be configured to coexist on the same port when the port is configured for hybrid mode.

Figure 1 Hybrid Port Application



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3.1.4 Configuring SCADA Bridges

Surveillance, Control, and Data Acquisition (SCADA) bridges are configured on an Integrated Services card as part of the multidrop data bridge (MDDB), pulse code modulation (PCM) multidrop bridge, and voice conference bridge (VCB) functionality. MDDB, PCM, and VCB are used to support SCADA systems on a 7705 SAR-8 or 7705 SAR-18.

For information on MDDB, see [Multidrop Data Bridge](#). For information on PCM multidrop bridge, see [PCM Multidrop Bridge](#). For information on VCB, see [Voice Conference Bridge](#).

A SCADA bridge can be configured after the IOM is activated (the card slot and card type are designated) and the adapter card slot is preprovisioned with the Integrated Services card **mda-type**.

3.2 Port Features

This section contains information on the following topics:

- [Multilink Point-to-Point Protocol](#)
- [Multi-Class MLPPP](#)
- [cHDL](#)
- [Inverse Multiplexing Over ATM \(IMA\)](#)
- [Network Synchronization on Ports and Circuits](#)
- [Node Synchronization From GNSS Receiver Ports](#)
- [Flow Control on Ethernet Ports](#)
- [Ethernet OAM](#)
- [Ethernet Loopbacks](#)
- [Ethernet Port Down-When-Looped](#)
- [Ethernet Ring \(Adapter Card and Module\)](#)
- [MTU Configuration Guidelines](#)
- [LAG](#)
- [LAG and ECMP Hashing](#)
- [Automatic Protection Switching](#)
- [Deploying Preprovisioned Components](#)
- [Microwave Link](#)
- [DSL Bonding](#)
- [Custom Alarms on Ethernet Ports](#)

3.2.1 Multilink Point-to-Point Protocol

This section contains information on the following topics:

- [MLPPP Overview](#)
- [Protocol Field \(PID\)](#)
- [B&E Bits](#)
- [Sequence Number](#)
- [Information Field](#)
- [Padding](#)
- [FCS](#)
- [LCP](#)
- [T1/E1 Link Hold Timers](#)

3.2.1.1 MLPPP Overview

Multilink point-to-point protocol (MLPPP) is a method of splitting, recombining, and sequencing packets across multiple logical data links. MLPPP is defined in the IETF RFC 1990, *The PPP Multilink Protocol (MP)*.

MLPPP allows multiple PPP links to be bundled together, providing a single logical connection between two routers. Data can be distributed across the multiple links within a bundle to achieve high bandwidth. As well, MLPPP allows for a single frame to be fragmented and transmitted across multiple links. This capability allows for lower latency and also for a higher maximum receive unit (MRU).

Multilink protocol is negotiated during the initial LCP option negotiations of a standard PPP session. A system indicates to its peer that it is willing to perform MLPPP by sending the MP option as part of the initial LCP option negotiation.

The system indicates the following capabilities.

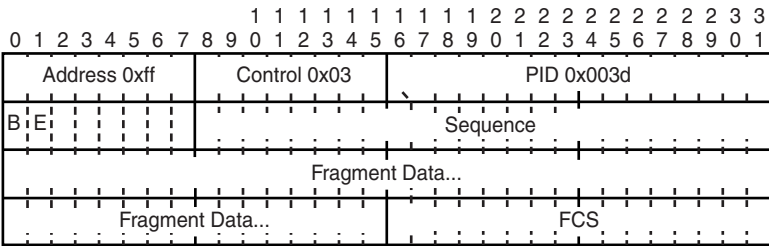
- The system offering the option is capable of combining multiple physical links into one logical link.
- The system is capable of receiving upper layer protocol data units (PDUs) that are fragmented using the MP header and then reassembling the fragments back into the original PDU for processing.
- The system is capable of receiving PDUs of size N octets, where N is specified as part of the option, even if N is larger than the maximum receive unit (MRU) for a single physical link.

Once MLPPP has been successfully negotiated, the sending system is free to send PDUs encapsulated and/or fragmented with the MP header.

MP introduces a new protocol type with a protocol ID (PID) of 0x003d. [Figure 2](#) and [Figure 3](#) show the MLPPP fragment frame structure. Framing to indicate the beginning and end of the encapsulation is the same as that used by PPP and described in RFC 1662, *PPP in HDLC-like Framing*.

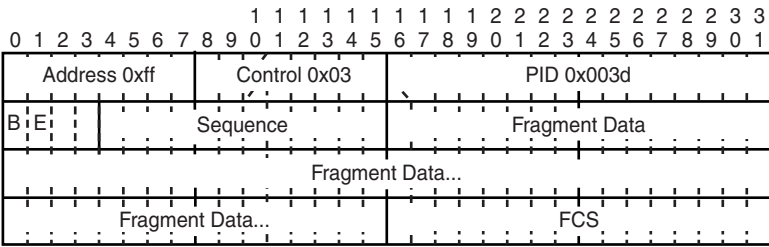
MP frames use the same HDLC address and control pair value as PPP: Address – 0xFF and Control – 0x03. The 2-octet protocol field is also structured the same way as in PPP encapsulation.

Figure 2 MLPPP 24-bit Fragment Format



19487

Figure 3 MLPPP 12-bit Fragment Format



19488

The required and default format for MP is the 24-bit format. During the LCP state, the 12-bit format can be negotiated. The 7705 SAR is capable of supporting and negotiating the alternate 12-bit frame format.

The maximum differential delay supported for MLPPP is 25 ms.

3.2.1.2 Protocol Field (PID)

The protocol field is two octets. Its value identifies the datagram encapsulated in the Information field of the packet. In the case of MP, the PID also identifies the presence of a 4-octet MP header (or 2-octet, if negotiated).

A PID of 0x003d identifies the packet as MP data with an MP header.

The LCP packets and protocol states of the MLPPP session follow those defined by PPP in RFC 1661. The options used during the LCP state for creating an MLPPP NCP session are described in the sections that follow.

3.2.1.3 B&E Bits

The B&E bits are used to indicate the start and end of a packet. Ingress packets to the MLPPP process will have an MTU, which may or may not be larger than the maximum received reconstructed unit (MRRU) of the MLPPP network. The B&E bits manage the fragmentation of ingress packets when the packet exceeds the MRRU.

The B-bit indicates the first (or beginning) packet of a given fragment. The E-bit indicates the last (or ending) packet of a fragment. If there is no fragmentation of the ingress packet, both B&E bits are set to true (=1).

3.2.1.4 Sequence Number

Sequence numbers can be either 12 or 24 bits long. The sequence number is 0 for the first fragment on a newly constructed bundle and increments by one for each fragment sent on that bundle. The receiver keeps track of the incoming sequence numbers on each link in a bundle and reconstructs the desired unbundled flow through processing of the received sequence numbers and B&E bits. For a detailed description of the algorithm, refer to RFC 1990.

3.2.1.5 Information Field

The Information field is zero or more octets. The Information field contains the datagram for the protocol specified in the protocol field.

The MRRU will have the same default value as the MTU for PPP. The MRRU is always negotiated during LCP.

3.2.1.6 Padding

On transmission, the Information field of the ending fragment may be padded with an arbitrary number of octets up to the MRRU. It is the responsibility of each protocol to distinguish padding octets from real information. Padding must only be added to the last fragment (E-bit set to true).

3.2.1.7 FCS

The FCS field of each MP packet is inherited from the normal framing mechanism from the member link on which the packet is transmitted. There is no separate FCS applied to the reconstituted packet as a whole if it is transmitted in more than one fragment.

3.2.1.8 LCP

The Link Control Protocol (LCP) is used to establish the connection through an exchange of configure packets. This exchange is complete, and the LCP opened state entered, once a Configure-Ack packet has been both sent and received.

LCP allows for the negotiation of multiple options in a PPP session. MP is somewhat different from PPP, and therefore the following options are set for MP and are not negotiated:

- no async control character map
- no magic number
- no link quality monitoring
- address and control field compression
- protocol field compression
- no compound frames
- no self-describing padding

Any non-LCP packets received during this phase must be silently discarded.

3.2.1.9 T1/E1 Link Hold Timers

T1/E1 link hold timers (or MLPPP link flap dampening) guard against the node reporting excessive interface transitions. Timers can be set to determine when link up and link down events are advertised; that is, up-to-down and down-to-up transitions of the interface are not advertised to upper layer protocols (are dampened) until the configured timer has expired.

3.2.2 Multi-Class MLPPP

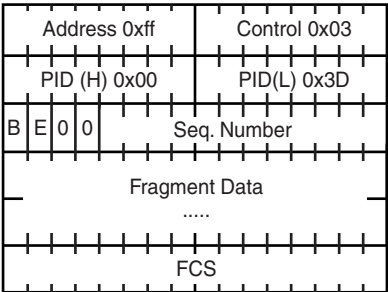
The 7705 SAR supports multi-class MLPPP (MC-MLPPP) to address end-to-end delay caused by low-speed links transporting a mix of small and large packets. With MC-MLPPP, large, low-priority packets are fragmented to allow opportunities to send high-priority packets. QoS for MC-MLPPP is described in [QoS in MC-MLPPP](#).

MC-MLPPP allows for the prioritization of multiple types of traffic flowing over MLPPP links, such as traffic between the cell site routers and the mobile operator's aggregation routers. MC-MLPPP, as defined in RFC 2686, *The Multi-Class Extension to Multi-Link PPP*, is an extension of the MLPPP standard. MC-MLPPP is supported on access ports wherever PPP/MLPPP is supported, except on the 2-port OC3/STM1 Channelized Adapter card. It allows multiple classes of fragments to be transmitted over an MLPPP bundle, with each class representing a different priority level mapped to a forwarding class. The highest-priority traffic is transmitted over the MLPPP bundle with minimal delay regardless of the order in which packets are received.

[Figure 4](#) shows the original MLPPP header format that allowed only two implied classes. The two classes were created by transmitting two interleaving flows of packets; one with MLPPP headers and one without. This resulted in two levels of priority sent over the physical link, even without the implementation of multi-class support.

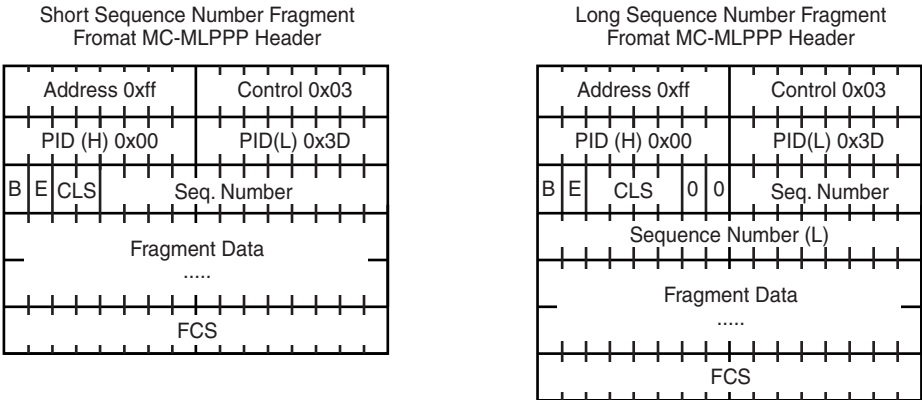
[Figure 5](#) shows the short and long sequence number fragment format MC-MLPPP headers. The short sequence number fragment format header includes two class bits to allow for up to four classes of service. Four class bits are available in the long sequence number fragment format header, but a maximum of four classes are still supported. This extension to the MLPPP header format is detailed in RFC 2686.

Figure 4 Original MLPPP Header Format



20492

Figure 5 MC-MLPPP Header Format



20491

The new MC-MLPPP header format uses the previously unused bits before the sequence number as the class identifier to allow four distinct classes of service to be identified.

3.2.2.1 QoS in MC-MLPPP

MC-MLPPP on the 7705 SAR supports scheduling based on multi-class implementation. Instead of the standard profiled queue-type scheduling, an MC-MLPPP encapsulated access port performs class-based traffic servicing. The four MC-MLPPP classes are scheduled in a strict priority fashion, as shown in [Table 7](#).

Table 7 MC-MLPPP Class Priorities

MC-MLPPP Class	Priority
0	Priority over all other classes
1	Priority over classes 2 and 3
2	Priority over class 3
3	No priority

For example, if a packet is sent to an MC-MLPPP class 3 queue and all other queues are empty, the 7705 SAR fragments the packet according to the configured fragment size and begins sending the fragments. If a new packet arrives at an MC-MLPPP class 2 queue while the class 3 fragment is still being serviced, the 7705 SAR finishes sending any fragments of the class 3 packet that are on the wire, then holds back the remaining fragments in order to service the higher-priority packet.

The fragments of the first packet remain at the top of the class 3 queue. For packets of the same class, MC-MLPPP class queues operate on a first-in, first-out basis.

The user configures the required number of MLPPP classes to use on a bundle. The forwarding class of the packet, as determined by the ingress QoS classification, is used to determine the MLPPP class for the packet. The mapping of forwarding class to MLPPP class is a function of the user-configurable number of MLPPP classes. The mapping for 4-class, 3-class, and 2-class MLPPP bundles is shown in [Table 8](#).

Table 8 Packet Forwarding Class to MC-MLPPP Class Mapping

FC ID	FC Name	MLPPP Class 4-class Bundle	MLPPP Class 3-class Bundle	MLPPP Class 2-class Bundle
7	NC	0	0	0
6	H1	0	0	0
5	EF	1	1	1
4	H2	1	1	1
3	L1	2	2	1
2	AF	2	2	1
1	L2	3	2	1
0	BE	3	2	1

If one or more forwarding classes are mapped to a queue, the scheduling priority of the queue is based on the lowest forwarding class mapped to it. For example, if forwarding classes 0 and 7 are mapped to a queue, the queue is serviced by MC-MLPPP class 3 in a 4-class bundle model.

3.2.3 cHDLC

The 7705 SAR supports Cisco HDLC, which is an encapsulation protocol for information transfer. Cisco HDLC is a bit-oriented synchronous data-link layer protocol that specifies a data encapsulation method on synchronous serial links using frame characters and checksums.

Cisco HDLC monitors line status on a serial interface by exchanging keepalive request messages with peer network devices. The protocol also allows routers to discover IP addresses of neighbors by exchanging SLARP address-request and address-response messages with peer network devices.

The basic frame structure of a cHDLC frame is shown in [Table 9](#).

Table 9 cHDLC Information Frame

Flag	Address	Control	Protocol	Information	FCS
0x7E	0x0F, 0x8F	0x00	0x0800, 0x8035	—	16 or 32 bit

The fields in the cHDLC frame have the following characteristics:

- Address field—supports unicast (0x0F) and broadcast (0x8F) addresses
- Control field—always set to 0x00
- Protocol field—supports IP (0x0800) and SLARP (0x8035; see [SLARP](#) for information about limitations)
- Information field—the length can be 0 to 9 kbytes
- FCS field—can be 16 or 32 bits. The default is 16 bits for ports with a speed equal to or lower than OC3, and 32 bits for all other ports. The FCS for cHDLC is calculated with the same method and same polynomial as PPP.

3.2.3.1 SLARP

The 7705 SAR supports only the SLARP keepalive protocol.

For the SLARP keepalive protocol, each system sends the other a keepalive packet at a user configurable interval. The default interval is 10 seconds. Both systems must use the same interval to ensure reliable operation. Each system assigns sequence numbers to the keepalive packets it sends, starting with zero, independent of the other system. These sequence numbers are included in the keepalive packets sent to the other system. Also included in each keepalive packet is the sequence number of the last keepalive packet received from the other system, as assigned by the other system. This number is called the returned sequence number. Each system keeps track of the last returned sequence number it has received. Immediately before sending a keepalive packet, the system compares the sequence number of the packet it is about to send with the returned sequence number in the last keepalive packet it has received. If the two differ by 3 or more, it considers the line to have failed, and will not route higher-level data across it until an acceptable keepalive response is received.

3.2.4 Inverse Multiplexing Over ATM (IMA)

IMA is a cell-based protocol where an ATM cell stream is inverse-multiplexed and demultiplexed in a cyclical fashion among ATM-supporting channels to form a higher bandwidth logical link. This logical link is called an IMA group. By grouping channels into an IMA group, customers gain bandwidth management capability at in-between rates (for example, between DS1 and DS3 or between E1 and E3) through the addition or removal of channels to or from the IMA group. The 7705 SAR supports the IMA protocol as specified by the *Inverse Multiplexing for ATM (IMA) Specification* version 1.1.

In the ingress direction, traffic coming over multiple ATM channels configured as part of a single IMA group is converted into a single ATM stream and passed for further processing to the ATM layer, where service-related functions (for example, Layer 2 traffic management or feeding into a pseudowire) are applied. In the egress direction, a single ATM stream (after service functions are applied) is distributed over all paths that are part of an IMA group after ATM layer processing takes place.

An IMA group interface compensates for differential delay and allows for only a minimal cell delay variation. The maximum differential delay supported for IMA is 75 ms on 16-port T1/E1 ASAP Adapter cards and 32-port T1/E1 ASAP Adapter cards and 50 ms on 2-port OC3/STM1 Channelized Adapter cards.

The interface deals with links that are added or deleted, or that fail. The higher layers see only an IMA group and not individual links; therefore, service configuration and management is done using IMA groups, and not individual links that are part of it.

The IMA protocol uses an IMA frame as the unit of control. An IMA frame consists of a series of 128 consecutive cells. In addition to ATM cells received from the ATM layer, the IMA frame contains IMA OAM cells. Two types of cells are defined: IMA Control Protocol (ICP) cells and IMA filler cells. ICP cells carry information used by the IMA protocol at both ends of an IMA group (for example, IMA frame sequence number, link stuff indication, status and control indication, IMA ID, Tx and Rx test patterns, version of the IMA protocol). A single ICP cell is inserted at the ICP cell offset position (the offset may be different on each link of the group) of each frame. Filler cells are used by the transmitting side to fill up each IMA frame in case there are not enough ATM stream cells from the ATM layer, so a continuous stream of cells is presented to the physical layer. Those cells are then discarded by the receiving end. IMA frames are transmitted simultaneously on all paths of an IMA group, and when they are received out of sync at the other end of the IMA group link, the receiver compensates for differential link delays among all paths.

3.2.5 Network Synchronization on Ports and Circuits

The 7705 SAR provides network synchronization on the following ports and CES circuits:

- [Network Synchronization on T1/E1, Ethernet, GPON, and DSL Ports](#)
- [Network Synchronization on SONET/SDH Ports](#)
- [Network Synchronization on DS3/E3 Ports](#)
- [Network Synchronization on DS3 CES Circuits](#)
- [Network Synchronization on T1/E1 Ports and Circuits](#)

3.2.5.1 Network Synchronization on T1/E1, Ethernet, GPON, and DSL Ports

Line timing mode provides physical layer timing (Layer 1) that can be used as an accurate reference for nodes in the network. This mode is immune to any packet delay variation (PDV) occurring on a Layer 2 or Layer 3 link. Physical layer timing provides the best synchronization performance through a synchronization distribution network.

On the 7705 SAR-A variant with T1/E1 ports, line timing is supported on T1/E1 ports. Line timing is also supported on all synchronous Ethernet ports on both 7705 SAR-A variants. Synchronous Ethernet is supported on the XOR ports (1 to 4), configured as either RJ-45 ports or SFP ports. Synchronous Ethernet is also supported on SFP ports 5 to 8. Ports 9 to 12 do not support synchronous Ethernet and, therefore, do not support line timing.

On the 7705 SAR-Ax, line timing is supported on all Ethernet ports.

On the 7705 SAR-H, line timing is supported on:

- all Ethernet ports
- T1/E1 ports on a chassis equipped with a 4-port T1/E1 and RS-232 Combination module

On the 7705 SAR-Hc, line timing is supported on all Ethernet ports.

On the 7705 SAR-M (variants with T1/E1 ports), line timing is supported on T1/E1 ports. Line timing is also supported on all RJ-45 Ethernet ports and SFP ports on the 7705 SAR-M (all variants).

On the 7705 SAR-W, line timing is supported on:

- RJ-45 Ethernet ports and optical SFP ports (these ports support synchronous Ethernet and IEEE 1588v2 PTP)

On the 7705 SAR-Wx, line timing is supported on:

- RJ-45 Ethernet ports and optical SFP ports (these ports support synchronous Ethernet and IEEE 1588v2 PTP)

On the 7705 SAR-X, line timing is supported on T1/E1 ports and Ethernet ports.

In addition, line timing is supported on the following modules when they are installed in chassis variants with module slots:

- GPON module
- 8-port xDSL module (NTR over ADSL2, ADSL2+, or VDSL2)
- 6-port DSL Combination module (two references are available: NTR over SHDSL and NTR over ADSL2, ADSL2+, or VDSL2)
- 2-port 10GigE (Ethernet) module
- 6-port SAR-M Ethernet module

On the 7705 SAR-8 and 7705 SAR-18, line timing is supported on:

- 16-port T1/E1 ASAP Adapter card (version 1 is not supported on the 7705 SAR-18)
- 32-port T1/E1 ASAP Adapter card
- 8-port Ethernet Adapter card, version 2, on the two Ethernet SFP ports with SFPs that support synchronous Ethernet
- 6-port Ethernet 10Gbps Adapter card
- 8-port Gigabit Ethernet Adapter card (dual-rate and copper SFPs do not support synchronous Ethernet)
- 2-port 10GigE (Ethernet) Adapter card
- 10-port 1GigE/1-port 10GigE X-Adapter card (not supported on the 7705 SAR-8)
- 4-port DS3/E3 Adapter card
- 2-port OC3/STM1 Channelized Adapter card
- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card
- 4-port OC3/STM1 Clear Channel Adapter card
- Packet Microwave Adapter card on ports that support synchronous Ethernet and on ports that support PCR

Synchronous Ethernet is a variant of line timing and is automatically enabled on ports and SFPs that support it. The operator can select a synchronous Ethernet port as a candidate for the timing reference. The recovered timing from this port is then used to time the system. This ensures that any of the system outputs are locked to a stable, traceable frequency source.

3.2.5.2 Network Synchronization on SONET/SDH Ports

Each SONET/SDH port can be independently configured to be loop-timed (recovered from an Rx line) or node-timed (recovered from the SSU in the active CSM).

A SONET/SDH port's receive clock rate can be used as a synchronization source for the node.

3.2.5.3 Network Synchronization on DS3/E3 Ports

Each clear channel DS3/E3 port on a 4-port DS3/E3 Adapter card can be independently configured to be loop-timed (recovered from an Rx line), node-timed (recovered from the SSU in the active CSM), or differential-timed (derived from the comparison of a common clock to the received RTP timestamp in TDM pseudowire packets). When a DS3 port is channelized, each DS1 or E1 channel can be independently configured to be loop-timed, node-timed, or differential-timed (differential timing on DS1/E1 channels is supported only on the first three ports of the card). When not configured for differential timing, a DS3/E3 port can be configured to be a timing source for the node.

3.2.5.4 Network Synchronization on DS3 CES Circuits

Each DS3 CES circuit on a 2-port OC3/STM1 Channelized Adapter card can be loop-timed (recovered from an Rx line) or free-run (timing source is from its own clock). A DS3 circuit can be configured to be a timing source for the node.

3.2.5.5 Network Synchronization on T1/E1 Ports and Circuits

Each T1/E1 port can be independently configured for loop-timing (recovered from an Rx line) or node-timing (recovered from the SSU in the active CSM).

In addition, T1/E1 CES circuits on the following can be independently configured for adaptive timing (clocking is derived from incoming TDM pseudowire packets):

- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- 7705 SAR-M (variants with T1/E1 ports)
- 7705 SAR-X
- 7705 SAR-A (variant with T1/E1 ports)
- T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module

T1/E1 CES circuits on the following can be independently configured for differential timing (recovered from RTP in TDM pseudowire packets):

- 16-port T1/E1 ASAP Adapter card, version 2
- 32-port T1/E1 ASAP Adapter card
- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card (DS1/E1 channels)

- 4-port DS3/E3 Adapter card (DS1/E1 channels on DS3 ports; E3 ports cannot be channelized); differential timing on DS1/E1 channels is supported only on the first three ports of the card
- 7705 SAR-M (variants with T1/E1 ports)
- 7705 SAR-X
- 7705 SAR-A (variant with T1/E1 ports)
- T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module

A T1/E1 port can be configured to be a timing source for the node.



Note: Adaptive timing and differential timing are not supported on DS1 or E1 channels that have CAS signaling enabled.

3.2.6 Node Synchronization From GNSS Receiver Ports

The GNSS receiver port on the 7705 SAR-Ax, 7705 SAR-Wx, and 7705 SAR-H GPS Receiver module, and the GNSS Receiver card installed in a 7705 SAR-8 or 7705 SAR-18, can provide a synchronization clock to the SSU in the router with the corresponding QL for SSM. This frequency can then be distributed to the rest of the router from the SSU as configured with the **ref-order** and **ql-selection** commands; refer to the 7705 SAR Basic System Configuration Guide for information. The GNSS reference is qualified only if the GNSS receiver port is operational, has sufficient satellites locked, and has a frequency successfully recovered. A PTP master/boundary clock can also use this frequency reference with PTP peers.

In the event of GNSS signal loss or jamming resulting in the unavailability of timing information, the GNSS receiver automatically prevents output of clock or synchronization data to the system, and the system can revert to alternate timing sources.

A 7705 SAR using GNSS or IEEE 1588v2 PTP for time of day/phase recovery can perform high-accuracy OAM timestamping and measurements. Refer to the 7705 SAR Basic System Configuration Guide for information about node timing sources.

3.2.7 Flow Control on Ethernet Ports

IEEE 802.3x Flow Control, which is the process of pausing the transmission based on received pause frames, is supported on Fast Ethernet, Gigabit Ethernet, and 10-Gigabit Ethernet (SFP+) ports. In the transmit direction, the Ethernet ports generate pause frames if the buffer occupancy reaches critical values or if port FIFO buffers are overloaded. Pause frame generation is automatically handled by the Ethernet Adapter card when the system-wide constant thresholds are exceeded. The generation of pause frames ensures that newly arriving frames still can be processed and queued, mainly to maintain the SLA agreements.

If autonegotiation is on for an Ethernet port, enabling and disabling of IEEE 802.3x Flow Control is autonegotiated for receive and transmit directions separately. If autonegotiation is turned off, the reception and transmission of IEEE 802.3x Flow Control is enabled by default and cannot be disabled.

Ingress flow control for the 6-port SAR-M Ethernet module is Ethernet link-based and not port-based. When IEEE 802.3x Flow Control is enabled on the 6-port SAR-M Ethernet module, pause frames are multicast to all ports on the Ethernet link. There are two Ethernet links on the 6-port SAR-M Ethernet module: one for ports 1, 3, and 5, and one for ports 2, 4, and 6. Pause frames are sent to either ports 1, 3, and 5, or to ports 2, 4, and 6, depending on which link the pause frame originates.

3.2.8 Ethernet OAM

This section contains information on the following topics:

- [Ethernet OAM Overview](#)
- [CRC \(Cyclic Redundancy Check\) Monitoring](#)
- [Remote Loopback](#)
- [802.3ah OAMPDU Tunneling and Termination for Epipe Service](#)
- [Dying Gasp](#)

3.2.8.1 Ethernet OAM Overview

802.3ah Clause 57 (EFM OAM) defines the Operations, Administration, and Maintenance (OAM) sublayer, which is a link level Ethernet OAM that is supported on 7705 SAR Ethernet ports and DSL ports configured as network or access ports. It provides mechanisms for monitoring link operations such as remote fault indication and remote loopback control. EFM OAM is not supported on the 7705 SAR-M GPON module.

Ethernet OAM gives network operators the ability to monitor the status of Ethernet links and quickly determine the location of failing links or fault conditions.

Because some of the sites where the 7705 SAR will be deployed will only have Ethernet uplinks, this OAM functionality is mandatory. For example, mobile operators must be able to request remote loopbacks from the peer router at the Ethernet layer in order to debug any connectivity issues. EFM OAM provides this capability.

EFM OAM is supported on network and access Ethernet and DSL ports, and is configured at the port level. The access ports can be configured to tunnel the OAM traffic originated by the far-end devices.

EFM OAM has the following characteristics.

- All EFM OAM, including loopbacks, operate on point-to-point links only.
- EFM loopbacks are always line loopbacks (line Rx to line Tx). Line loopbacks are not supported on DSL ports.
- When a port is in loopback, all frames (except EFM frames) are discarded. If dynamic signaling and routing is used (dynamic LSPs, OSPF, IS-IS, or BGP routing), all services also go down. If all signaling and routing protocols are static (static routes, LSPs, and service labels), the frames are discarded but services stay up.

The following EFM OAM functions are supported:

- OAM capability discovery
- configurable transmit interval with an Information OAMPDU
- active or passive mode
- OAM loopback
- OAMPDU tunneling and termination (for Epipe service)
- dying gasp at network and access ports

For information on Epipe service, refer to the 7705 SAR Services Guide, “Ethernet VLL (Epipe) Services”, and the 7705 SAR OAM and Diagnostics Guide, “Ethernet OAM Capabilities”.

3.2.8.2 CRC (Cyclic Redundancy Check) Monitoring

CRC errors typically occur when Ethernet links are compromised due to optical fiber degradation, weak optical signals, bad optical connections, or problems on a third-party networking element. As well, higher-layer OAM options such as EFM and BFD may not detect errors and trigger appropriate alarms and switchovers if the errors are intermittent, since this does not affect the continuous operation of other OAM functions.

CRC error monitoring on Ethernet ports allows degraded links to be alarmed or failed in order to detect network infrastructure issues, trigger necessary maintenance, or switch to redundant paths. This is achieved through monitoring ingress error counts and comparing them to the configured error thresholds. The rate at which CRC errors are detected on a port can trigger two alarm states. Crossing the configured signal degrade (SD) threshold (**sd-threshold**) causes an event to be logged and an alarm to be raised, which alerts the operator to a potential issue on a link. Crossing the configured signal failure (SF) threshold (**sf-threshold**) causes the affected port to enter the operationally down state, and causes an event to be logged and an alarm to be raised.

The CRC error rates are calculated as $M \times 10E-N$, which is the ratio of errored frames allowed for total frames received. The operator can configure both the threshold (N) and a multiplier (M). If the multiplier is not configured, the default multiplier (1) is used. For example, setting the SD threshold to 3 results in a signal degrade error rate threshold of $1 \times 10E-3$ (1 errored frame per 1000 frames). Changing the configuration to an SD threshold of 3 and a multiplier of 5 results in a signal degrade error rate threshold of $5 \times 10E-3$ (5 errored frames per 1000 frames). The signal degrade error rate threshold must be lower than the signal failure error rate threshold because it is used to notify the operator that the port is operating in a degraded but not failed condition.

A sliding window (**window-size**) is used to calculate a statistical average of CRC error statistics collected every second. Each second, the oldest statistics are dropped from the calculation. For example, if the default 10-s sliding window is configured, at the 11th second the oldest second of statistical data is dropped and the 11th second is included. This sliding average is compared against the configured SD and SF thresholds to determine if the error rate over the window exceeds one or both of the thresholds, which will generate an alarm and log event.

When a port enters the failed condition as a result of crossing an SF threshold, the port is not automatically returned to service. Because the port is operationally down without a physical link, error monitoring stops. The operator can enable the port by using the **shutdown** and **no shutdown** port commands or by using other port transition functions such as clearing the MDA (**clear mda** command) or removing the cable. A port that is down due to crossing an SF threshold can also be re-enabled by changing or disabling the SD threshold. The SD state is self-clearing, and it clears if the error rate drops below 1/10th of the configured SD rate.



Note: CRC monitoring is not supported on GPON or DSL ports.

3.2.8.3 Remote Loopback

EFM OAM provides a link-layer frame loopback mode, which can be controlled remotely.

To initiate a remote loopback, the local EFM OAM client sends a loopback control OAMPDU by enabling the OAM remote loopback command. After receiving the loopback control OAMPDU, the remote OAM client puts the remote port into local loopback mode.

OAMPDUs are slow protocol frames that contain appropriate control and status information used to monitor, test, and troubleshoot OAM-enabled links.

To exit a remote loopback, the local EFM OAM client sends a loopback control OAMPDU by disabling the OAM remote loopback command. After receiving the loopback control OAMPDU, the remote OAM client puts the port back into normal forwarding mode.

When a port is in local loopback mode (the far end requested an Ethernet OAM loopback), any packets received on the port will be looped back, except for EFM OAMPDUs. No data will be transmitted from the node; only data that is received on the node will be sent back out.

When the node is in remote loopback mode, local data from the CSM is transmitted, but any data received on the node is dropped, except for EFM OAMPDUs.

Remote loopbacks should be used with caution; if dynamic signaling and routing protocols are used, all services go down when a remote loopback is initiated. If only static signaling and routing is used, the services stay up. On the 7705 SAR, the Ethernet port can be configured to accept or reject the **remote-loopback** command.

3.2.8.4 802.3ah OAMPDU Tunneling and Termination for Epipe Service

Customers who subscribe to Epipe service might have customer equipment running 802.3ah at both ends. The 7705 SAR can be configured to tunnel EFM OAMPDUs received from a customer device to the other end through the existing network using MPLS or GRE, or to terminate received OAMPDUs at a network or an access Ethernet port.

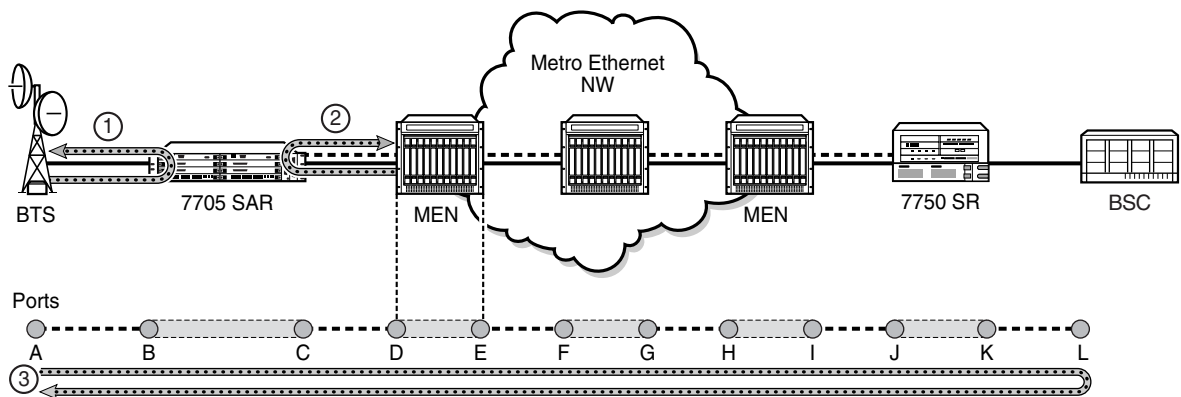


Note: This feature applies only to port-based Epipe SAPs because 802.3ah runs at port level, not at VLAN level.

While tunneling offers the ability to terminate and process the OAM messages at the head-end, termination on the first access port at the cell site can be used to detect immediate failures or can be used to detect port failures in a timelier manner. The user can choose either tunneling or termination, but not both at the same time.

In [Figure 6](#), scenario 1 shows the termination of received EFM OAMPDUs from a customer device on an access port, while scenario 2 shows the same thing except for a network port. Scenario 3 shows tunneling of EFM OAMPDUs through the associated Ethernet PW. To configure termination (scenario 1), use the **config>port>ethernet>efm-oam>no shutdown** command.

Figure 6 EFM Capability on the 7705 SAR



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3.2.8.5 Dying Gasp

Dying gasp is used to notify the far end that EFM-OAM is disabled or shut down on the local port. The dying gasp flag is set on the OAMPDUs that are sent to the peer. The far end can then take immediate action and inform upper layers that EFM-OAM is down on the port.

When a dying gasp is received from a peer, the node logs the event and generates an SNMP trap to notify the operator.

3.2.9 Ethernet Loopbacks

This section contains information on the following topics:

- [Line and Internal Ethernet Loopbacks](#)
- [CFM Loopbacks for OAM on Ethernet Ports](#)

[Table 10](#) lists the loopbacks supported on Ethernet, DSL module (6-port DSL Combination module and 8-port xDSL module), and GPON module ports.

Table 10 Loopbacks Supported on Ethernet, DSL, and GPON Ports

Loopback			
	Ethernet	DSL	GPON
Timed network line loopback	✓		✓
Timed and untimed access line loopbacks	✓		✓
Timed and untimed access internal loopbacks	✓	✓	✓
Persistent access line loopback	✓		
Persistent access internal loopback	✓		
MAC address swapping	✓		
CFM loopback on network and access ports	✓	✓	✓
CFM loopback on ring ports and v-port	✓		

3.2.9.1 Line and Internal Ethernet Loopbacks

A line loopback loops frames received on the corresponding port back towards the transmit direction. Line loopbacks are supported on ports configured for access or network mode.

Similarly, a line loopback with MAC addressing loops frames received on the corresponding port back towards the transmit direction, and swaps the source and destination MAC addresses before transmission. See [MAC Swapping](#) for more information.

An internal loopback loops frames from the local router back to the framer. This is usually referred to as an equipment loopback. The transmit signal is looped back and received by the interface. Internal loopbacks are supported on ports configured in access mode.

If a loopback is enabled on a port, the port mode cannot be changed until the loopback has been disabled.

A port can support only one loopback at a time. If a loopback exists on a port, it must be disabled or the timer must expire before another loopback can be configured on the same port. EFM-OAM cannot be enabled on a port that has an Ethernet loopback enabled on it. Similarly, an Ethernet loopback cannot be enabled on a port that has EFM-OAM enabled on it.

When an internal loopback is enabled on a port, autonegotiation is turned off silently. This is to allow an internal loopback when the operational status of a port is down. Any user modification to autonegotiation on a port configured with an internal Ethernet loopback will not take effect until the loopback is disabled.

The loopback timer can be configured from 30 s to 86400 s. All non-zero timed loopbacks are turned off automatically under the following conditions: an adapter card reset, DSL module reset, GPON module reset, an activity switch, or timer expiry. Line or internal loopback timers can also be configured as a latched loopback by setting the timer to 0 s, or as a persistent loopback with the **persistent** keyword. Latched and persistent loopbacks are enabled indefinitely until turned off by the user. Latched loopbacks survive adapter card resets and activity switches, but are lost if there is a system restart. Persistent loopbacks survive adapter card resets and activity switches and can survive a system restart if the **admin-save** or **admin-save-detail** command was executed prior to the restart. Latched loopbacks (untimed) and persistent loopbacks can be enabled only on Ethernet access ports.

Persistent loopbacks are the only Ethernet loopbacks saved to the database by the **admin-save** and **admin-save-detail** commands.

An Ethernet port loopback may interact with other features. See [Interaction of Ethernet Port Loopback with Other Features](#) for more information.

3.2.9.1.1 MAC Swapping

Typically, an Ethernet port loopback only echoes back received frames. That is, the received source and destination MAC addresses are not swapped. However, not all Ethernet equipment supports echo mode, where the original sender of the frame must support receiving its own port MAC address as the destination MAC address.

The MAC swapping feature on the 7705 SAR is an optional feature that will swap the received destination MAC address with the source MAC address when an Ethernet port is in loopback mode. After the swap, the FCS is recalculated to ensure the validity of the Ethernet frame and to ensure that the frame is not dropped by the original sender due to a CRC error.

MAC swapping is not supported on the GPON module, 6-port DSL Combination module, or 8-port xDSL module.

3.2.9.1.2 Interaction of Ethernet Port Loopback with Other Features

EFM OAM and line loopback are mutually exclusive. If one of these functions is enabled, it must be disabled before the other can be used.

However, a line loopback precedes the dot1x behavior. That is, if the port is already dot1x-authenticated it will remain so. If it is not, EAP authentication will fail.

Ethernet port-layer line loopback and Ethernet port-layer internal loopback can be enabled on the same port with the down-when-looped feature. EFM OAM cannot be enabled on the same port with the down-when-looped feature. For more information, see [Ethernet Port Down-When-Looped](#).

3.2.9.2 CFM Loopbacks for OAM on Ethernet Ports

This section contains information on the following topics:

- [CFM Loopback Overview](#)
- [CFM Loopback Mechanics](#)

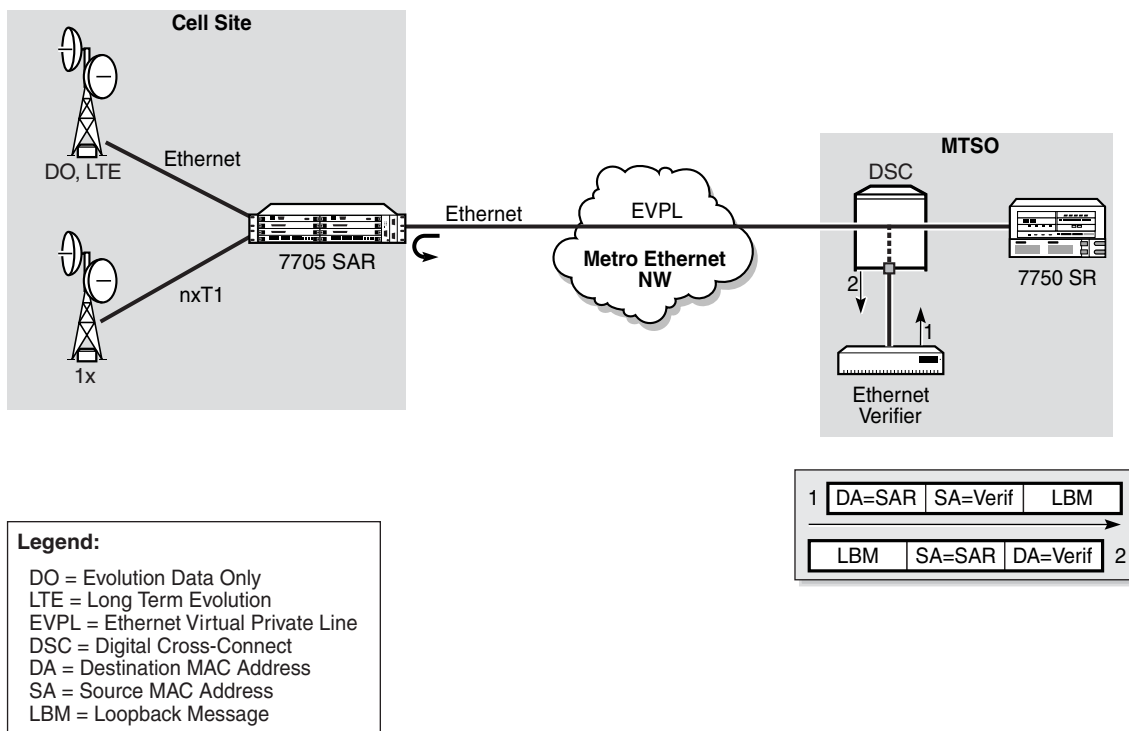
3.2.9.2.1 CFM Loopback Overview

Connectivity fault management (CFM) loopback support for loopback messages (LBMs) on Ethernet ports allows operators to run standards-based Layer 1 and Layer 2 OAM tests on ports receiving unlabeled packets.

The 7705 SAR supports CFM MEPs associated with different endpoints (that is, spoke SDP Down MEPs, network interface facility MEPs, and SAP Up and SAP Down MEPs). In addition, for traffic received from an uplink (network ingress), the 7705 SAR supports CFM LBM for both labeled and unlabeled packets. CFM loopbacks are applied to the Ethernet port.

Refer to the 7705 SAR OAM and Diagnostics Guide, “Ethernet OAM Capabilities”, for information on CFM MEPs.

[Figure 7](#) shows an application where an operator leases facilities from a transport network provider in order to transport traffic from a cell site to their MTSO. The operator leases a certain amount of bandwidth between the two endpoints (the cell site and the MTSO) from the transport provider, who offers Ethernet Virtual Private Line (EVPL) or Ethernet Private Line (EPL) PTP service. Before the operator offers services on the leased bandwidth, the operator runs OAM tests to verify the SLA. Typically, the transport provider (MEN provider) requires that the OAM tests be run in the direction of (towards) the first Ethernet port that is connected to the transport network. This is done in order to eliminate the potential effect of queuing, delay, and jitter that may be introduced by a spoke SDP or SAP.

Figure 7 CFM Loopback on Ethernet Ports

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Figure 7 shows an Ethernet verifier at the MTSO that is directly connected to the transport network (in front of the 7750 SR). Thus, the Ethernet OAM frames are not label-encapsulated. Given that Ethernet verifiers do not support label operations and the transport provider mandates that OAM tests be run between the two hand-off Ethernet ports, the verifier cannot be relocated behind the 7750 SR node at the MTSO. Therefore, CFM loopback frames received are not MPLS-encapsulated, but are simple Ethernet frames where the **type** is set to CFM (dot1ag or Y.1731).

3.2.9.2.2 CFM Loopback Mechanics

The following list contains important facts to consider when working with CFM loopbacks:

- CFM loopbacks can be enabled on a per-port basis, and:
 - the port can be in access or network mode
 - once enabled on a port, all received LBM frames are processed, regardless of the VLAN and the service that the VLAN or SAP is bound to

- there is no associated MEP creation involved with this feature; therefore, no domain, association, or similar checks are performed on the received frame
 - upon finding a destination address MAC match, the LBM frame is sent to the CFM process
- CFM loopback support on a physical ring port on the 2-port 10GigE (Ethernet) Adapter card or 2-port 10GigE (Ethernet) module differs from other Ethernet ports. For these ports, **cfm-loopback** is configured, optionally, using **dot1p** and **match-vlan** to create a list of up to 16 VLANs. The null VLAN is always applied. The CFM Loopback Message will be processed if it does not contain a VLAN header, or if it contains a VLAN header with a VLAN ID that matches one in the configured **match-vlan** list.
- received LBM frames undergo no queuing or scheduling in the ingress direction
- at egress, loopback reply (LBR) frames are stored in their own queue; that is, a separate new queue is added exclusively for LBR frames
- users can configure the way a response frame is treated among other user traffic stored in network queues; the configuration options are high-priority, low-priority, or dot1p, where dot1p applies only to physical ring ports
- for network egress, where profiled scheduling is enabled, the following conditions apply:
 - **high-priority**: either cir = port_speed, which applies to all frames that are scheduled via an in-profile scheduler; or round-robin (RR) for all other (network egress queue) frames that are in-profile
 - **low-priority**: either cir = 0, pir = port_speed, which applies to all frames that are scheduled as out-of-profile, or RR for all other frames that are out-of-profile
- for network egress or access egress, where 4-priority scheduling is enabled:
 - **high-priority**: either cir = port_speed, which applies to all frames that are scheduled via an expedited in-profile scheduler, or RR for all other (network egress queue) frames that reside in expedited queues and are in an in-profile state
 - **low-priority**: either cir = 0, pir = port_speed, which applies to all frames that are scheduled via a best effort out-of-profile scheduler, or RR for all other frames that reside in best-effort queues and are in an out-of-profile state
- for the 8-port Gigabit Ethernet Adapter card, the 10-port 1GigE/1-port 10GigE X-Adapter card, and the v-port on the 2-port 10GigE (Ethernet) Adapter card and 2-port 10GigE (Ethernet) module, for network egress, where 16-priority scheduling is enabled:
 - **high-priority**: has higher priority than any user frames
 - **low-priority**: has lower priority than any user frames

- for the physical ring ports on the 2-port 10GigE (Ethernet) Adapter card and 2-port 10GigE (Ethernet) module, which can only operate as network egress, the priority of the LBR frame is derived from the dot1p setting of the received LBM frame. Based on the assigned ring-type network queue policy, dot1p-to-queue mapping is handled using the same mapping rule that applies to all other user frames.
- the above queue parameters and scheduler mappings are all preconfigured and cannot be altered. The desired QoS treatment is selected by enabling the CFM loopback and specifying **high-priority**, **low-priority**, or **dot1p**.

3.2.10 Ethernet Port Down-When-Looped

Newly provisioned circuits are often put into loopback with a physical loopback cable for testing and to ensure the ports meet the SLA. If loopbacks are not cleared, or physically removed, by the operator when the testing is completed, they can adversely affect the performance of all other SDPs and customer interfaces (SAPs). This is especially problematic for point-to-multipoint services such as VPLS, since Ethernet does not support TTL, which is essential in terminating loops.

The down-when-looped feature is used on the 7705 SAR to detect loops within the network and to ensure continued operation of other ports. When the down-when-looped feature is activated, a keepalive loop PDU is transmitted periodically toward the network. The Ethernet port then listens for returning keepalive loop PDUs. In unicast mode, a loop is detected if any of the received PDUs have an Ethertype value of 9000, which indicates a loopback (Configuration Test Protocol), and the source (SRC) and destination (DST) MAC addresses are identical to the MAC address of the Ethernet port. In broadcast mode, a loop is detected if any of the received PDUs have an Ethertype value of 9000 and the SRC MAC address matches the MAC address of the Ethernet port and the DST MAC address matches the broadcast MAC address. When a loop is detected, the Ethernet port is immediately brought down. Down-when-looped is supported on Ethernet ports, DSL module ports, and GPON module ports.

Ethernet port-layer line loopbacks and the down-when-looped feature can be enabled on the same port. The keepalive loop PDU is still transmitted; however, if the port receives its own keepalive loop PDU, the keepalive PDU is extracted and processed to avoid infinite looping.

Ethernet port-layer internal loopbacks and the down-when-looped feature can also be enabled on the same port. When the keepalive PDU is internally looped back, it is extracted and processed as usual. If the SRC MAC address matches the port MAC address, the port is disabled due to detection of a loop. If the SRC MAC address is a broadcast MAC address because the **swap-src-dst-mac** option in the **loopback** command is enabled, then there is no change to port status and it remains operationally up.

EFM OAM and down-when-looped cannot be enabled on the same port.

3.2.11 Ethernet Ring (Adapter Card and Module)

The 2-port 10GigE (Ethernet) Adapter card can be installed in a 7705 SAR-8 or 7705 SAR-18 chassis and the 2-port 10GigE (Ethernet) module can be installed in a 7705 SAR-M to connect to and from access rings carrying a high concentration of traffic. For the maximum number of cards or modules supported per chassis, see [Table 3](#).

A number of 7705 SAR nodes in a ring typically aggregate traffic from customer sites, map the traffic to a service, and connect to an SR node. The SR node acts as a gateway point out of the ring. A 10GigE ring allows for higher bandwidth services and aggregation on a per-7705 SAR basis. The 2-port 10GigE (Ethernet) Adapter card/module increases the capacity of backhaul networks by providing 10GigE support on the aggregation nodes, thus increasing the port capacity.

In a deployment of a 2-port 10GigE (Ethernet) Adapter card/module, each 7705 SAR node in the ring is connected to the east and west side of the ring over two different 10GigE ports. If 10GigE is the main uplink, the following are required for redundancy:

- two cards per 7705 SAR-8
- two cards per 7705 SAR-18
- two 7705 SAR-M nodes, each equipped with 2-port 10GigE (Ethernet) module

With two cards per 7705 SAR-8 or 7705 SAR-18 node, for example, east and west links of the ring can be terminated on two different adapter cards, reducing the impact of potential hardware failure.

The physical ports on the 2-port 10GigE (Ethernet) Adapter card/module boot up in network mode and this network setting cannot be disabled or altered. At boot-up, the MAC address of the virtual port (v-port) is programmed automatically for efficiency and security reasons.

There is native built-in Ethernet bridging among the ring ports and the v-port. Bridging destinations for traffic received from one of the ring ports include the 10GigE ring port and the network interfaces on the v-port. Bridging destinations for traffic received from the v-port include one or both of the 10GigE ring ports.

With bridging, broadcast and multicast frames are forwarded over all ports except the received one. Unknown frames are forwarded to both 10GigE ports if received from the v-port or forwarded to the other 10GigE port only if received from one of the 10GigE ports (the local v-port MAC address is always programmed).

The bridge traffic of the physical 10GigE ports is based on learned and programmed MAC addresses.

3.2.12 MTU Configuration Guidelines

This section contains information on the following topics:

- [MTU Configuration Overview](#)
- [IP Fragmentation](#)
- [Jumbo Frames](#)
- [Default Port MTU Values](#)

3.2.12.1 MTU Configuration Overview

Because of the services overhead (that is, pseudowire/VLL, MPLS tunnel, dot1q/qinq and dot1p overhead), it is crucial that configurable variable frame size be supported for end-to-end service delivery.

Observe the following general rules when planning your service and physical Maximum Transmission Unit (MTU) configurations.

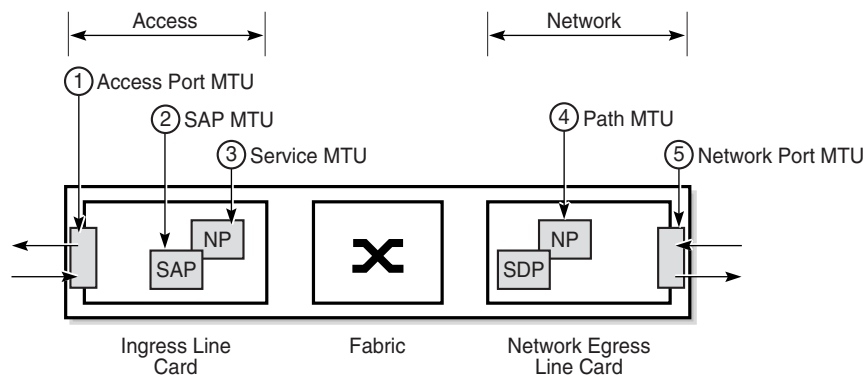
- The 7705 SAR must contend with MTU limitations at many service points. The physical (access and network) port, service, and SDP MTU values must be individually defined. [Figure 8](#) identifies the various MTU points on the 7705 SAR.
- The ports that will be designated as network ports intended to carry service traffic must be identified.
- MTU values should not be modified frequently.
- MTU values must conform to both of the following conditions:
 - the service MTU must be less than or equal to the SDP path MTU

- the service MTU must be less than or equal to the access port (SAP) MTU
- When the **allow-fragmentation** command is enabled on an SDP, the current MTU algorithm is overwritten with the configured path MTU. The administrative MTU and operational MTU both show the specified MTU value. If the path MTU is not configured or available, the operational MTU is set to 2000 bytes, and the administrative MTU displays a value of 0. When **allow-fragmentation** is disabled, the operational MTU reverts to the previous value.

For more information, refer to the “MTU Settings” section in the 7705 SAR Services Guide. To configure various MTU points, use the following commands:

- port MTUs are set with the **mtu** command, under the **config>port** context, where the port type can be Ethernet, DSL, GPON, TDM, serial, or SONET/SDH
- service MTUs are set in the appropriate **config>service** context
- path MTUs are set with the **path-mtu** command under the **config>service>sdp** context

Figure 8 MTU Points on the 7705 SAR



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Frame size configuration is supported for an Ethernet port configured as an access or a network port.

For an Ethernet adapter card that does not support jumbo frames, all frames received at an ingress network or access port are policed against 1576 bytes (1572 + 4 bytes of FCS), regardless of the port MTU. Any frames longer than 1576 bytes are discarded and the “Too Long Frame” and “Error Stats” counters in the port statistics display are incremented. See [Jumbo Frames](#) for more information.

At network egress, Ethernet frames are policed against the configured port MTU. If the frame exceeds the configured port MTU, the “Interface Out Discards” counter in the port statistics is incremented.

When the network group encryption (NGE) feature is used, additional bytes due to NGE packet overhead must be considered. Refer to the “NGE Packet Overhead and MTU Considerations” section in the 7705 SAR Services Guide for more information.

3.2.12.2 IP Fragmentation

IP fragmentation is used to fragment a packet that is larger than the MTU of the egress interface, so that the packet can be transported over that interface.

For IPv4, the router fragments or discards the IP packets based on whether the DF (Do not fragment) bit is set in the IP header. If the packet that exceeds the MTU cannot be fragmented, the packet is discarded and an ICMP message “Fragmentation Needed and Don’t Fragment was Set” is sent back to the source IP address.

For IPv6, the router cannot fragment the packet so must discard it. An ICMP message “Packet too big” is sent back to the source node.

As a source of self-generated traffic, the 7705 SAR can perform packet fragmentation.

Fragmentation can be enabled for GRE tunnels. Refer to the “GRE Fragmentation” section in the 7705 SAR Services Guide for more information.

3.2.12.3 Jumbo Frames

Jumbo frames are supported on Ethernet ports except on the 8-port Ethernet Adapter card (version 1).

The maximum MTU size for a jumbo frame on the 7705 SAR is 9732 bytes. The maximum MTU for a jumbo frame may vary depending on the Ethernet encapsulation type, as shown in [Table 11](#). The calculations of the other MTU values (service MTU, path MTU, and so on) are based on the port MTU. The values in [Table 11](#) are also maximum receive unit (MRU) values. MTU values are user-configured values. MRU values are the maximum MTU value that a user can configure on an adapter card that supports jumbo frames.

Table 11 Maximum MTU (or MRU) per Ethernet Encapsulation Type

Encapsulation	Maximum MTU (bytes)
Null	9724

Table 11 Maximum MTU (or MRU) per Ethernet Encapsulation Type

Encapsulation	Maximum MTU (bytes)
Dot1q	9728
QinQ	9732

For an Ethernet Adapter card, all frames received at an ingress network or access port are policed against the MRU for the ingress adapter card, regardless of the configured MTU. Any frames larger than the MRU are discarded and the “Too Long Frame” and “Error Stats” counters in the port statistics display are incremented.

At network egress, frames are checked against the configured port MTU. If the frame exceeds the configured port MTU and the DF bit is set, then the “MTU Exceeded” discard counter will be incremented on the ingress IP interface statistics display, or on the MPLS interface statistics display if the packet is an MPLS packet.

For example, on adapter cards that do not support an MTU greater than 2106 bytes, fragmentation is not supported for frames greater than the maximum supported MTU for that card (that is, 2106 bytes). If the maximum supported MTU is exceeded, the following occurs.

- An appropriate ICMP reply message (Destination Unreachable) is generated by the 7705 SAR. The router ensures that the ICMP generated message cannot be used as a DOS attack (that is, the router paces the ICMP message).
- The appropriate statistics are incremented.

Jumbo frames offer better utilization of an Ethernet link because as more payload is packed into an Ethernet frame of constant size, the ratio of overhead to payload is minimized.

From the traffic management perspective, large payloads may cause long delays, so a balance between link utilization and delay must be found. For example, for ATM VLLs, concatenating a large number of ATM cells when the MTU is set to a very high value could generate a 9-kbyte ATM VLL frame. Transmitting a frame that large would take more than 23 ms on a 3-Mb/s policed Ethernet uplink.

3.2.12.3.1 Behavior of Adapter Cards Not Supporting Jumbo Frames on 7705 SAR-8 and 7705 SAR-18 only

The 7705 SAR-8 (with CSMv2) and the 7705 SAR-18 do not support ingress fragmentation, and this is true for jumbo frames. Therefore, any jumbo frame packet arriving on one of these routers that gets routed to an adapter card that does not support jumbo frame MTU (for example, a 16-port T1/E1 ASAP Adapter card or a 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card) is discarded if the packet size is greater than the TDM port's maximum supported MTU. If the maximum-supported MTU is exceeded, the following occurs.

- An appropriate ICMP reply message (Destination Unreachable) is generated by the 7705 SAR. The router ensures that the ICMP-generated message cannot be used as a DOS attack (that is, the router paces the ICMP message).
- The port statistics show IP or MPLS Interface MTU discards, for IP or MPLS traffic, respectively. MTU Exceeded Packets and Bytes counters exist separately for IPv4/6 and MPLS under the IP interface hierarchy for all discarded packets where ICMP Error messages are not generated.

For example, if a packet arrives on an 8-port Gigabit Ethernet Adapter card and is to be forwarded to a 16-port T1/E1 ASAP Adapter card with a maximum port MTU of 2090 bytes and a channel group configured for PPP with the port MTU of 1000 bytes, the following may occur.

- If the arriving packet is 800 bytes, then forward the packet.
- If the arriving packet is 1400 bytes, then forward the packet, which will be fragmented by the egress adapter card.
- If the arriving packet is fragmented and the fragments are 800 bytes, then forward the packet.
- If the arriving packet is 2500 bytes, then send an ICMP error message (because the egress adapter card has a maximum port MTU of 2090 bytes).
- If the arriving packet is fragmented and the fragment size is 2500 bytes, then there is an ICMP error.

3.2.12.3.2 Jumbo Frame Behavior on the Fixed Platforms

The 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-M, 7705 SAR-W, 7705 SAR-Wx, and 7705 SAR-X are able to fragment packets between Ethernet ports (which support jumbo frames) and TDM ports (which do not support jumbo frames). In this case, when a packet arrives from a port that supports jumbo frames and is routed to a port that does not support jumbo frames (that is, a TDM port) the packet will get fragmented to the port MTU of the TDM port.

For example, if a packet arrives on a 7705 SAR-A and is to be forwarded to a TDM port that has a maximum port MTU of 2090 bytes and a channel group configured for PPP with the port MTU of 1000 bytes (PPP port MTU), the following may occur.

- If the arriving packet is 800 bytes, then forward the packet.
- If the arriving packet is 1400 bytes and the DF bit is 0, then forward the packet, which will be fragmented to the PPP port MTU size.
- If the arriving packet is 2500 bytes and the DF bit is 0, then forward the packet, which will be fragmented to the PPP port MTU size.

3.2.12.3.3 Multicast Support for Jumbo Frames

Jumbo frames are supported in a multicast configuration as long as all adapter cards in the multicast group support jumbo frames. If an adapter card that does not support jumbo frames is present in the multicast group, the replicated multicast jumbo frame packet will be discarded by the fabric because of an MRU error of the fabric port (RX).

The multicast group replicates the jumbo frame for all adapter cards, regardless of whether they support jumbo frames, only when forwarding the packet through the fabric. The replicated jumbo frame packet is discarded on adapter cards that do not support jumbo frames.

3.2.12.3.4 PMC Jumbo Frame Support

For the Packet Microwave Adapter card (PMC), ensure that the microwave hardware installed with the card supports the corresponding jumbo frame MTU. If the microwave hardware does not support the jumbo frame MTU, it is recommended that the MTU of the PMC port be set to the maximum frame size that is supported by the microwave hardware.

3.2.12.4 Default Port MTU Values

[Table 12](#) displays the default and maximum port MTU values that are dependent upon the port type, mode, and encapsulation type.



Note: The 7705 SAR now supports a lower IP MTU value of 128 bytes (from the original 512-byte minimum). The IP MTU is derived from the port MTU configuration for network ports. This lower IP MTU is supported only on Ethernet encapsulated ports. Refer to the 7705 SAR Services Guide, “Bandwidth Optimization for Low-speed Links” for information.

Table 12 Port MTU Default and Maximum Values

Port Type	Mode	Encap Type	Default (bytes)	Max MTU (bytes)
10/100 Ethernet ¹	Access/ Network	null	1514	9724 ²
		dot1q	1518	9728 ²
		qinq ³	1522 (access only)	9732 (access only) ²
GigE SFP ¹ and 10-GigE SFP+	Access/ Network	null	1514 (access) 1572 (network)	9724 (access and network)
		dot1q	1518 (access) 1572 (network)	9728 (access and network)
		qinq ³	1522 (access only)	9732 (access only)
Ring port	Network	null	9728 (fixed)	9728 (fixed)
v-port (on Ring adapter card)	Network	null	1572	9724
		dot1q	1572	9728
DSL: SHDSL bonding (7705 SAR-M)	Access/ Network	null	1514 (access) 1572 (network)	2044
		dot1q	1518 (access) 1572 (network)	2048
DSL: xDSL bonding (7705 SAR-M)	Access/ Network	null	1514 (access) 1572 (network)	1996
		dot1q	1518 (access) 1572 (network)	2000
DSL: xDSL bonding (7705 SAR-Wx)	Access/ Network	null	1514 (access) 1572 (network)	1996
		dot1q	1518 (access) 1572 (network)	2000
		qinq ³	1522 (access only)	2000 (access only)
GPON	Access/ Network	null	1514 (access) 1572 (network)	2000
		dot1q	1518 (access) 1572 (network)	2000
TDM (PW)	Access	cem	1514	1514

Table 12 Port MTU Default and Maximum Values (Continued)

Port Type	Mode	Encap Type	Default (bytes)	Max MTU (bytes)
TDM (ATM PW)	Access	atm	1524	1524
TDM (FR PW)	Access	frame-relay	1514	2090
TDM (HDLC PW)	Access	hdlc	1514	2090
TDM (IW PW)	Access	cisco-hdlc	1514	2090
TDM (PPP/MLPPP)	Access	ipcp	1502	2090
	Network	ppp-auto	1572	2090
Serial V.35 or X.21 ⁴ (FR PW)	Access	frame-relay	1514	2090
Serial V.35 or X.21 ⁴ (HDLC PW)	Access	hdlc	1514	2090
Serial V.35 or X.21 ⁴ (IW PW)	Access	frame-relay	1514	2090
		ipcp	1502	2090
		cisco-hdlc	1514	2090
SONET/SDH	Access	atm	1524	1524
SONET/SDH	Network	ppp-auto	1572	2090

Notes:

1. The maximum MTU value is supported only on cards that have buffer chaining enabled; therefore, it is not supported on the 8-port Ethernet Adapter card, version 1.
2. On the Packet Microwave Adapter card, the MWA ports support 4 bytes less than the Ethernet ports. Thus, MWA ports support a maximum MTU of 9720 bytes (null) or 9724 bytes (dot1q). MWA ports do not support QinQ.
3. QinQ is supported only on access ports.
4. For X.21 serial ports at super-rate speeds.

For more information, refer to the “MTU Settings” section in the 7705 SAR Services Guide.

3.2.13 LAG

This section contains information on the following topics:

- [LAG Overview](#)

- [LACP and Active/Standby Operation](#)
- [QoS Adaptation for LAG on Access](#)
- [Access Ingress Fabric Shaping](#)
- [Hold-down Timers](#)
- [Multi-Chassis LAG](#)
- [Static LAG \(Active/Standby LAG Operation without LACP\)](#)
- [LAG Support on Mixed-Generation Hardware](#)

3.2.13.1 LAG Overview

The 7705 SAR supports Link Aggregation Groups (LAGs) based on the IEEE 802.1ax standard (formerly 802.3ad). Link aggregation provides:

- increased bandwidth by combining multiple links into one logical link (in active/active mode)
- load sharing by distributing traffic across multiple links (in active/active mode)
- redundancy and increased resiliency between devices by having a standby link to act as backup if the active link fails (in active/standby mode)

In the 7705 SAR implementation, all links must operate at the same speed.

Packet sequencing must be maintained for any given session. The hashing algorithm deployed by Nokia routers is based on the type of traffic transported to ensure that all traffic in a flow remains in sequence while providing effective load sharing across the links in the LAG. See [LAG and ECMP Hashing](#) for more information.

LAGs must be statically configured or formed dynamically with Link Aggregation Control Protocol (LACP). See [LACP and Active/Standby Operation](#) for information on LACP.

All Ethernet-based supported services can benefit from LAG, including:

- network interfaces and SDPs
- spoke and mesh SDP terminations
- IES and VPRN interfaces and SAPs
- Ethernet and IP pseudowire SAPs
- routed VPLS (r-VPLS) SAPs

LAGs are supported on access, network, and hybrid ports. A LAG can be in active/active mode or in active/standby mode for access, network, or hybrid ports. Active/standby mode is a subset of active/active mode if subgroups are enabled.

LAGs are supported on access ports on the following:

- 8-port Ethernet Adapter card, version 2
- 8-port Gigabit Ethernet Adapter card
- 10-port 1GigE/1-port 10GigE X-Adapter card (10-port GigE mode)
- 6-port Ethernet 10Gbps Adapter card
- 4-port SAR-H Fast Ethernet module
- 6-port SAR-M Ethernet module
- Packet Microwave Adapter card (for ports not in a microwave link)
- all fixed platforms

LAGs are supported on network ports on the following:

- 8-port Ethernet Adapter card, version 2
- 8-port Gigabit Ethernet Adapter card
- 10-port 1GigE/1-port 10GigE X-Adapter card
- 6-port Ethernet 10Gbps Adapter card
- 4-port SAR-H Fast Ethernet module
- 6-port SAR-M Ethernet module
- Packet Microwave Adapter card (for ports not in a microwave link and ports in a 1+0 network microwave link; LAGs are not supported on ports in a 1+1 HSB microwave link)
- all fixed platforms

LAGs are supported on hybrid ports on the following:

- 8-port Gigabit Ethernet Adapter card
- 10-port 1GigE/1-port 10GigE X-Adapter card (10-port GigE mode)
- 6-port Ethernet 10Gbps Adapter card
- 6-port SAR-M Ethernet module
- Packet Microwave Adapter card (for ports not in a microwave link)
- all fixed platforms

On access ports, a LAG supports active/active and active/standby operation. For active/standby operation the links must be in different subgroups. Links can be on the same platform or adapter card/module or distributed over multiple components. Load sharing is supported among the active links in a LAG group.

On network ports, a LAG supports active/active and active/standby operation. For active/standby operation the links must be in different subgroups. Links can be on the same platform or adapter card/module or distributed over multiple components. Load sharing is supported among the active links in a LAG group. Any tunnel type (for example, IP, GRE, or MPLS) transporting any service type, any IP traffic, or any labeled traffic (LER, LSR) can use the LAG load-sharing, active/active, and active/standby functionality.

LAGs are supported on network 1+0 microwave links. Ports that are in a microwave link can be added to the same LAG as ports that are not in a microwave link. Ports belonging to a microwave link must have limited autonegotiation enabled before the link can be added to a LAG.

A LAG that contains ports in a microwave link must have LACP enabled for active/standby operation. Static LAG configuration (without LACP) is not supported for active/standby LAGs with microwave-enabled ports.

On hybrid ports, a LAG supports active/active and active/standby operation. For active/standby operation the links must be in different subgroups. Links can be on the same platform or adapter card/module or distributed over multiple components. Load sharing is supported among the active links in a LAG group.

A LAG group with assigned members can be converted from one mode to another as long as the number of member ports are supported in the new mode and the ports all support the new mode, none of the members belong to a microwave link, and the LAG group is not associated with a network interface or a SAP.



Note: For details on LAG scale per platform or adapter card, contact your Nokia Technical support representative.

A subgroup is a group of links within a LAG. On access, network, or hybrid ports, a LAG can have a maximum of four subgroups and a subgroup can have links up to the maximum number supported on the LAG. The LAG is active/active if there is only one sub-group and is active/standby if there is more than one subgroup.

When configuring a LAG, most port features (port commands) can only be configured on the primary member port. The configuration, or any change to the configuration, is automatically propagated to any remaining ports within the same LAG. Operators cannot modify the configurations on non-primary ports. For more information, see [Configuring LAG Parameters](#).

If the LAG has one member link on a first- or second-generation (Gen-1 or Gen-2) Ethernet adapter card, and the other link on a third-generation (Gen-3) Ethernet adapter card or platform, a mix-and-match scenario exists for traffic management on the LAG SAP. In this case, all QoS parameters for the LAG SAP are configured but only those parameters applicable to the active member link are used. See [LAG Support on Mixed-Generation Hardware](#) for more information.

Configuring a multiservice site (MSS) aggregate rate can restrict the use of LAG SAPs. For more information, refer to the “MSS and LAG Interaction on the 7705 SAR-8 and 7705 SAR-18” section in the 7705 SAR Quality of Service Guide.

3.2.13.2 LACP and Active/Standby Operation

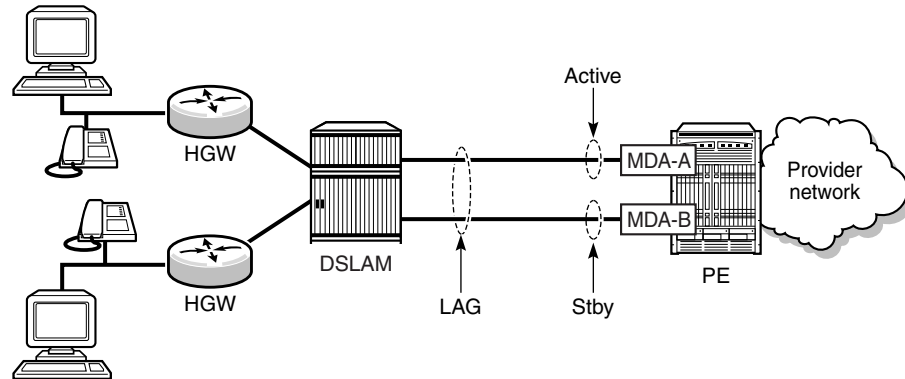
On access, network, and hybrid ports, where multiple links in a LAG can be active at the same time, normal operation is that all non-failing links are active and traffic is load-balanced across all the active links. In some cases, however, it is desirable to have only some of the links active and the other links kept in standby mode. The Link Aggregation Control Protocol (LACP) is used to make the selection of the active links in a LAG predictable and compatible with any vendor equipment. The mechanism is based on the IEEE 802.1ax standard so that interoperability is ensured.



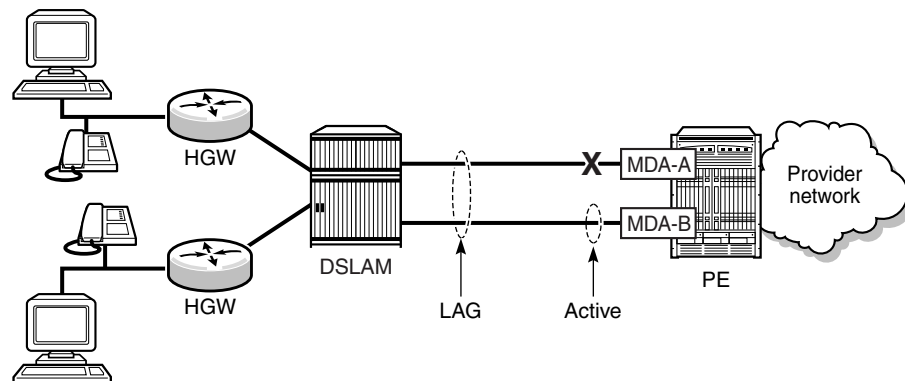
Note: LACP cannot be configured for static LAG. For more information on static LAG, see [Static LAG \(Active/Standby LAG Operation without LACP\)](#).

LACP is disabled by default and therefore must be enabled on the LAG if required. LACP can be used in either active mode or passive mode. The mode must match with connected CE devices for proper operation. For example, if the LAG on the 7705 SAR end is configured to be active, the CE end must be passive.

[Figure 9](#) shows the interconnection between a DSLAM and a LAG aggregation node. In this configuration, LAG is used to protect against hardware failure. If the active link goes down, the link on standby takes over (see [Figure 10](#)). The links are distributed across two different adapter cards to eliminate a single point of failure.

Figure 9 LAG on Access Interconnection

22319

Figure 10 LAG on Access Failure Switchover

22320

LACP handles active/standby operation of LAG subgroups as follows.

- Each link in a LAG is assigned to a subgroup. On access, network, and hybrid ports, a LAG can have a maximum of four subgroups and a subgroup can have up to the maximum number of links supported for the LAG. The selection algorithm implemented by LACP ensures that only one subgroup in a LAG is selected as active.
- The algorithm selects the active link as follows.
 - If multiple subgroups satisfy the selection criteria, the subgroup currently active remains active. Initially, the subgroup containing the highest-priority (lowest value) eligible link is selected as active.

- An eligible member is a link that can potentially become active. This means it is operationally up, and if the slave-to-partner flag is set, the remote system did not disable its use (by signaling standby).
- The selection algorithm works in a revertive mode (for details, refer to the IEEE 802.1ax standard). This means that every time the configuration or status of a subgroup changes, the selection algorithm reruns. If multiple subgroups satisfy the selection criteria, the subgroup currently active remains active. This behavior does not apply if the **selection-criteria** *hold-time* parameter is set to infinite.

Log events and traps are generated at both the LAG and link level to indicate any LACP changes. See the TIMETRA-LAG-MIB for details.

3.2.13.3 QoS Adaptation for LAG on Access

QoS on access port LAGs (access ports and hybrid ports in access mode) is handled differently from QoS on network port LAGs. Based on the configured hashing, traffic on a SAP can be sent over multiple LAG ports or can use a single port of a LAG. There are two user-selectable adaptive QoS modes (distribute and link) that allow the user to determine how the configured QoS rate is distributed to each of the active LAG port SAP queue schedulers, SAP schedulers (H-QoS), and MSS schedulers. These modes are:

- **adapt-qos distribute**

For SAP queue schedulers, SAP schedulers (H-QoS), and SAP egress MSS schedulers, distribute mode divides the QoS rates (as specified by the SLA) equally among the active LAG links (ports). For example, if a SAP queue PIR and CIR are configured on an active/active LAG SAP to be 200 Mb/s and 100 Mb/s respectively, and there are four active LAG ports, the SAP queue on each LAG port will be configured with a PIR of 50 Mb/s ($200/4$) and a CIR of 25 Mb/s ($100/4$).

For the SAP ingress MSS scheduler, the scheduler rate is configured on an MDA basis. Distributive adaptive QoS divides the QoS rates (as specified by the SLA) among the active link MDAs proportionally to the number of active links on each MDA. For example, if an MSS shaper group with an aggregate rate of 200 Mb/s and a CIR of 100 Mb/s is assigned to an active/active LAG SAP where the LAG has two ports on MDA 1 and three ports on MDA 2, the MSS shaper group on MDA 1 will have an aggregate rate of 80 Mb/s ($200 \times 2/5$ of the SLA) and a CIR of 40 Mb/s ($100 \times 2/5$ of the SLA). MDA 2 will have an aggregate rate of 120 Mb/s ($200 \times 3/5$) and a CIR of 60 Mb/s ($100 \times 3/5$).

- **adapt-qos link** (default)

For SAP queue schedulers, SAP schedulers (H-QoS), and SAP egress MSS schedulers, link mode forces the full QoS rates (as specified by the SLA) to be configured on each of the active LAG links. For example, if a SAP queue PIR and CIR are configured on an active/active LAG SAP to be 200 Mb/s and 100 Mb/s respectively, and there are two active LAG ports, the SAP queue on each LAG port will be configured to the full SLA, which is a PIR of 200 Mb/s and a CIR of 100 Mb/s.

For the SAP ingress MSS scheduler, the scheduler rate is configured on an MDA basis. In LAG link mode, each active LAG link MDA MSS shaper scheduler is configured with the full SLA. For example, if an MSS shaper group is configured with an aggregate rate of 200 Mb/s and CIR of 100 Mb/s and is assigned to an active/active LAG SAP with three ports on MDA 1 and two ports on MDA 2, the MSS shaper group on MDA 1 and MDA 2 are each configured with the full SLA of 200 Mb/s for the aggregate rate and 100 Mb/s for the CIR.

Table 13 shows examples of rate and bandwidth distributions based on the **adapt-qos** mode configuration.

Table 13 Adaptive QoS Rate and Bandwidth Distribution

	Distribute	Link
SAP queue scheduler	Rate distributed = rate / number of active links	100% rate configured on each LAG SAP queue
SAP scheduler (H-QoS)	Rate distributed = rate / number of active links	100% rate configured on each SAP scheduler
SAP egress MSS scheduler	Rate distributed = rate / number of active links	100% rate configured on each port's MSS scheduler
SAP ingress MSS scheduler	Rate distributed per active LAG MDA = rate × (number of active links on MDA / total number of active links)	100% rate configured on each active LAG MDA MSS scheduler

The following restrictions apply to ingress MSS LAG adaptive QoS (distribute mode).

- A unique MSS shaper group must be used per LAG when a non-default ingress MSS shaper group is assigned to a LAG SAP using adaptive QoS.
- When a shaper group is assigned to a LAG SAP using adaptive QoS, all ports in the LAG group must have their MDAs assigned to the same shaper policy.

The following restrictions apply to egress MSS LAG.

- The shaper policy for all LAG ports in a LAG must be the same and can only be configured on the primary LAG port member.

The following limitations apply to adaptive QoS (distribute mode).

- The QoS rates for an ingress LAG using adaptive QoS are only distributed among the active links when a non-default shaper group is used. If a default shaper group is used, the full QoS rates are configured for each port in the LAG as if link mode is being used.
- The QoS rates for an ingress or egress LAG using adaptive QoS will not be distributed among the active links when a user sets the PIR/CIR on a SAP queue, or aggregate rate/CIR on a SAP scheduler or MSS scheduler, to the default values (max and 0).
- A port on an 8-port Ethernet Adapter card, version 2, can be added to a LAG group but does not support H-QoS or MSS. If distributed mode is applied to a LAG SAP with a port on an 8-port Ethernet Adapter card, version 2, the H-QoS and MSS bandwidth distribution is determined based on all active links including the 8-port Ethernet Adapter card, version 2 port. However, the H-QoS or MSS bandwidth share for this port cannot be configured. Ports on other adapter cards, modules, or platforms will have their H-QoS or MSS bandwidth share configured.

3.2.13.3.1 Adaptive QoS Examples (Distribute Mode)

The following examples can be used as guidelines for configuring **adapt-qos distribute**.

SLA distribution for SAP queue-level PIR/CIR configuration

- Configure a **qos sap-ingress** policy with a queue ID of 2, a PIR of 200 Mb/s, and a CIR of 100 Mb/s. Assign it to an active/active LAG SAP with five active ports.
- For each port, the PIR/CIR configuration of SAP queue 2 is calculated so that the PIR = 40 Mb/s and CIR = 20 Mb/s.
- If one link goes down, the PIR/CIR configuration of SAP queue 2 on each active port is recalculated so that the PIR = 50 Mb/s and CIR = 25 Mb/s.

SLA distribution for ingress/egress (H-QoS)

- Create a LAG SAP with two different ports (for example, port 1/1/1 and port 1/1/2) in a LAG subgroup.

- Configure a LAG SAP aggregate rate of 200 Mb/s and a CIR of 100 Mb/s.
- To maintain the SLA, the SAP aggregate rate and CIR must be divided by the number of operational links in the LAG group.
- Because there are two active ports (links) in this LAG, the H-QoS aggregate rate and CIR are divided evenly between the two ports.
- The port 1/1/1 SAP scheduler (H-QoS) aggregate rate is 100 Mb/s and the CIR is 50 Mb/s.
- The port 1/1/2 SAP scheduler (H-QoS) aggregate rate is 100 Mb/s and the CIR is 50 Mb/s.

SLA distribution for Ingress MSS

- Configure a shaper group with an ID of 2 with an aggregate rate of 200 Mb/s and a CIR of 100 Mb/s.
- Create a LAG SAP using shaper group 2 that has two ports from one MDA (for example, ports 1/1/1 and 1/1/2) and three ports from a different MDA (for example, ports 1/2/1, 1/2/2, and 1/2/3) in its LAG group.
- The ingress MSS scheduler rate is configured on an MDA basis. Adaptive QoS divides the QoS rates among the active link MDAs, proportionally to the number of active links on each MDA.
- For MDA 1, the MSS shaper group aggregate rate is 80 Mb/s and the CIR is 40 Mb/s (2/5 of the bandwidth with two active links on MDA 1).
- For MDA 2, the MSS shaper group aggregate rate is 120 Mb/s and the CIR is 60 Mb/s (3/5 of the bandwidth with three active links on MDA 2).

3.2.13.4 Access Ingress Fabric Shaping

In order to avoid traffic congestion and ease the effects of possible bursts, a fabric shaper is implemented on each adapter card. Traffic being switched to a LAG SAP on an access interface goes through fabric shapers that are either in aggregate mode or destination mode. When in destination mode, the multipoint shaper is used to set the rate on all adapter cards. For more information on the modes used in fabric shaping, refer to the 7705 SAR Quality of Service Guide, “Configurable Ingress Shaping to Fabric (Access and Network)”.



Note: Even though the multipoint shaper is used to set the fabric shaping rate for traffic switched to a LAG SAP, it is the per-destination unicast counters that are incremented to show the fabric statistics rather than the multipoint counter. Only the fabric statistics of the active port of the LAG are incremented, not the standby port.

3.2.13.5 Hold-down Timers

Hold-down timers control how quickly a LAG responds to operational port state changes. The following timers are supported:

- port-level hold-time (up/down) timer

This timer controls the delay before a port is added to or removed from a LAG when the port comes up or goes down. Each port in the LAG has the same timer value, which is configured on the primary LAG link (port). The timer is set with the **config>port>ethernet>hold-time** command.

- subgroup-level hold-down timer

This timer controls the delay before a switch from the current subgroup to a new candidate subgroup, selected by the LAG subgroup selection algorithm. The timer is set with the **config>lag>selection-criteria** command.

The timer can be configured to never expire, which prevents a switch from an operationally up subgroup to a new candidate subgroup. This setting can be manually overridden by using the **tools>perform>force>lag-id** command (refer to the 7705 SAR OAM and Diagnostics Guide, “Tools Command Reference”, for information on this command).

If the port-level timer is set, it must expire before the subgroup selection occurs and this timer is started. The subgroup-level timer is supported only for LAGs running LACP.

- LAG-level hold-down timer

This timer controls the delay before a LAG is declared operationally down when the available links fall below the required port or bandwidth minimum. This timer is recommended for MC-LAG operation. The timer prevents a LAG from being brought down when an MC-LAG switchover executes a make-before-break switch. The LAG-level timer is set with the **config>lag>hold-time** down command.

If the port-level timer is set, it must expire before the LAG operational status is processed and this timer is started.

3.2.13.6 Multi-Chassis LAG

Multi-chassis LAG (MC-LAG) is a redundancy feature on the 7705 SAR, useful for nodes that are taken out of service for maintenance, upgrades, or relocation. MC-LAG also provides redundancy for incidents of peer nodal failure. Refer to the “Multi-Chassis LAG Redundancy” section in the 7705 SAR Basic System Configuration Guide.

3.2.13.7 Static LAG (Active/Standby LAG Operation without LACP)

Some Layer 2 capable network equipment devices support LAG protected links in an active/standby mode but without LACP. This is commonly referred to as static LAG. In order to interwork with these products, the 7705 SAR supports configuring LAG without LACP.

LACP provides a standard means of communicating health and status information between LAG peers. If LACP is not used, the peers must be initially configured in a way that ensures that the ports on each end are connected and communicating. Otherwise, LAG will not be active. Which LAG peer is made active is a local decision. If the port **priority** settings are the same for all ports, it is possible that the two ends will select ports on different physical links and LAG will not be active. Decide the primary link by setting the port **priority** for the LAG on each peer to ensure that the active ports on each end coincide with the same physical link.

The key parameters for configuring static LAG are **selection-criteria** (set to **best-port**) and **standby-signaling** (set to **power-off**). The selection criteria is used to determine which selection algorithm decides the primary port (the active port in a no-fault condition). It is always the subgroup with the **best-port** (the highest-priority port - lowest configured value) that is chosen as the active subgroup. The selection criteria must be set to **best-port** before standby signaling can be placed in **power-off** mode. Once the selection criteria is set to **best-port**, setting the **standby-signaling** parameter to **power-off** causes the transmitters on the standby ports to be powered down.

After a switchover caused by a failure on the active link, the transmitters on the standby link are powered on. The switch time for static LAG is typically longer than it is with LACP, due to the time it takes for the transmitters to come up and transmission to be established. When the fault is restored, static LAG causes a revertive switch to take place. The revertive switch is of shorter duration than the initial switchover since the system is able to prepare the other side for the switch and initiate the switchover once it is ready.



Note: Since the transmitters on the standby link are off, it is not possible for the LAG to respond to a physical disconnect (fault) on the standby link. This means that it is possible to have a failure on the active link result in a switch to a failed standby link.

3.2.13.8 LAG Support on Mixed-Generation Hardware

This section contains information on the following topics:

- [LAG Configuration at SAP Level](#)
- [LAG Configuration at Port Level](#)

3.2.13.8.1 LAG Configuration at SAP Level

The 6-port Ethernet 10Gbps Adapter card and the 7705 SAR-X are third-generation (Gen-3) hardware components. All other Ethernet cards are second-generation (Gen-2) adapter cards, except the 8-port Ethernet Adapter card, which is a first-generation (Gen-1) adapter card. See [Table 2](#) for a list of first-, second-, and third-generation Ethernet adapter cards, ports, and platforms.

The 7705 SAR supports mix-and-match traffic management (TM) across LAG members, where one member is a port on a Gen-3 adapter card or platform and the other member is a port on either a Gen-2 or Gen-1 adapter card or platform. Mix-and-match LAG does not apply to the 7705 SAR-X because it has only Gen-3 Ethernet ports.

For mix-and-match LAG TM scenarios, the 7705 SAR supports a generic QoS configuration, where the operator can configure all the settings available on each generation adapter card, but it is the card responsible for transporting traffic that determines which settings are applicable. That is, only the settings that apply to the active member port are used. The only exception is if there is a Gen-1 adapter card in the mix. In this case **scheduling-mode** cannot be changed to 16-priority scheduling. Only 4-priority scheduling is applicable.

For example, configuring **scheduling-mode** applies to Gen-2 adapter card SAPs but does not apply to the Gen-3 adapter card SAPs because Gen-3 cards support only one scheduling mode (4-priority), which is its implicit (default) scheduler mode and is not configurable. In another example, although per-SAP (second-tier) shaper rates can be configured for Gen-2 and Gen-3 cards, they will not be applied to Gen-1 cards.

Since it cannot be known whether SAP traffic rides over a Gen-2 or a Gen-3 adapter card and whether both adapter cards support H-QoS (tier 2, per-SAP shapers), the operator can choose to configure per-SAP aggregate CIR and PIR shaper rates. When the active link is on a Gen-2- or Gen-3-based port, per-SAP aggregate CIR and PIR rates are both used to enforce shaper rates, except when the active link is on a Gen-3-based port and traffic is in the network egress direction. In this case, only the PIR portion of the per-SAP aggregate rate is used to enforce shaper rates.

In the following descriptions of LAG configuration, **scheduler-mode**, *agg-rate*, and *cir-rate* refer to SAP configuration, as shown below for an Epipe SAP. Similar commands exist for SAPs in other services as well as for egress traffic.

```
config>service>epipe>sap lag-id>ingress#
scheduler-mode {4-priority | 16-priority}
agg-rate-limit agg-rate [cir cir-rate]
```

**Note:**

- The SAP identifier in the previous command has a *lag-id* (LAG SAP), not a *port-id* (regular SAP). A LAG SAP references two ports (one active and one standby), but only one port at a time carries traffic.
- The *agg-rate* is a PIR rate.

For information on traffic management for Gen-3 adapter cards and platforms, refer to the “QoS for Gen-3 Adapter Cards and Platforms” section in the 7705 SAR Quality of Service Guide.

For mix-and-match LAG configurations, the following behaviors apply.

- The configured aggregate rate on the LAG SAP is used to dictate the per-SAP aggregate rate on the active LAG port, regardless of which generation of adapter card is used (Gen-3 or Gen-2) or the configured scheduler mode. On a Gen-2 adapter card, the aggregate rate only applies when the port is in 16-priority scheduler mode. This behavior implies the following points.
 - The scheduler mode can be set to 16-priority or 4-priority. When servicing packets, the Gen-2-based datapath uses the configured scheduler mode (16-priority or 4-priority), while the Gen-3-based datapath always uses 4-priority scheduling.
 - When the traffic is transported over a Gen-3-based port (that is, the active link is on a Gen-3-based adapter card), the aggregate rate (*agg-rate*) is used to enforce a maximum shaper rate, as is the aggregate rate CIR (*cir-rate*).
 - When the active link is on a Gen-2-based adapter card, both aggregate rate CIR and PIR (*cir-rate* and *agg-rate*) are used. The aggregate rate (PIR) enforces the per-SAP bandwidth limit, and the CIR is used to identify in-profile and out-of-profile packets for aggregate scheduling purposes.
 - When the active link is on a Gen-1-based adapter card, aggregate rate CIR and PIR do not apply.

In addition, the following items describe mix-and-match LAG configuration behavior (that is, how the LAG SAP settings are applied or ignored depending on the active member port).

- For a LAG SAP, **scheduler-mode**, *agg-rate*, and *cir-rate* are all configurable on a per-SAP basis, regardless of the LAG member port combination (that is, both Gen-2 ports, both Gen-3 ports, or a Gen-2-/Gen-3 port mix).
- **Scheduler-mode** can be set to 4-priority or 16-priority, regardless of the LAG member port combination, except when one member is a port on a Gen-1 adapter card. In this case, only 4-priority scheduling is available.
- *Agg-rate* and *cir-rate* can be set whether **scheduler-mode** is set to 4-priority or 16-priority.
- The configured **scheduler-mode** applies to Gen-2-based LAG member ports only, and is not used for Gen-3-based LAG member ports. Gen-3 cards always use 4-priority scheduler mode and Gen-1 cards always use 4-priority scheduler mode. The **unshaped-sap-cir** keyword does not apply to Gen-3 SAPs because Gen-3 SAPs are all shaped SAPs.
- If **scheduler-mode** is 4-priority on the LAG SAP, where the LAG has one Gen-1-based or Gen-2-based port member and one Gen-3-based port member, the following points apply.
 - The Gen-1-based or Gen-2-based adapter card is configured with 4-priority scheduling, while *agg-rate* and *cir-rate* are not applied, and H-QoS is not enabled.
 - The Gen-3-based adapter card is configured with *agg-rate* and *cir-rate*, while **scheduler-mode** is ignored.
 - When LAG active/standby switching occurs from an active Gen-3-based port to an active Gen-1-based or Gen-2-based port, traffic management is changed from a 4-priority scheduler with H-QoS to a 4-priority scheduler without H-QoS that behaves like an unshaped SAP.
 - For the reverse case, when LAG active/standby switching occurs from an active Gen-1-based or Gen-2-based port to an active Gen-3-based port, traffic management is changed from a 4-priority scheduler without H-QoS to a 4-priority scheduler with H-QoS.
- If **scheduler-mode** is 16-priority on the LAG SAP, where the LAG has one Gen-2-based port member and one Gen-3-based port member, the following points apply.
 - The Gen-2-based adapter card is configured with 16-priority scheduling mode, *agg-rate* and *cir-rate*. This means that H-QoS is enabled.
 - The Gen-3-based adapter card is configured with *agg-rate* and *cir-rate*, while **scheduler-mode** is ignored.
 - When LAG active/standby switching occurs from an active Gen-3-based port to an active Gen-2-based port, traffic management is changed from a 4-priority scheduler with H-QoS using the *agg-rate* and *cir-rate*, to a 16-priority scheduler with H-QoS using the *agg-rate* and the *cir-rate* (that is, from 4-priority (Gen-3) mode to 16-priority mode for shaped SAPs).

- For the reverse case, when LAG active/standby switching occurs from an active Gen-2-based port to an active Gen-3-based port, traffic management is changed from a 16-priority scheduler with H-QoS using the *agg-rate* and the *cir-rate*, to a 4-priority (Gen-3) scheduler with H-QoS enabled using the *agg-rate* and the *cir-rate*.
- If **scheduler-mode** is 16-priority mode on the LAG SAP, the combination of a Gen-1-based port with a Gen-2-based or Gen-3-based port is blocked because Gen-1 adapter cards do not support 16-priority mode. The only valid option for this combination of ports is 4-priority scheduling mode.

Lastly, for LAG on access ports, the primary port configuration settings are applied to both the primary and secondary LAG ports. Therefore, in order to support unshaped SAPs when the primary port is a Gen-3-based port and the secondary port is a Gen-2-based port, configuring the **unshaped-sap-cir** on the Gen-3-based port is allowed, even though it does not apply to the Gen-3-based port. This is because **unshaped-sap-cir** is needed by the secondary Gen-2-based port when it becomes the active port. The full command is **config>port>ethernet>access>egress>unshaped-sap-cir** *cir-rate*.

3.2.13.8.2 LAG Configuration at Port Level

The 7705 SAR allows all configurations on Gen-1, Gen-2, and Gen-3 ports, even if some or all of the configuration is not applicable to all the ports. The software uses only the settings that are applicable to the particular port and ignores those that are not applicable. Any change to the primary LAG member configuration propagates to all non-primary ports.

[Table 14](#) lists the port commands that can be affected by LAG configuration, indicates the command's applicability to Gen-1, Gen-2, and Gen-3 ports, and describes the LAG behavior for mixed LAG configuration.



Note: For LAG on network ports, the **egress-rate**, **unshaped-if-cir**, and **network-queue** policy can only be configured on the primary LAG port and this configuration is propagated to the other LAG members.

Table 14 Port Command Applicability for LAG Configurations on Mixed-Generation Hardware

CLI Command	Gen-1 Port	Gen-2 Port	Gen-2 Port on Module ¹	Gen-3 Port	Configuration Behavior
unshaped-if-cir	Supported ²	Supported ²	Supported ²	Supported ³	Allowed on Gen-1, Gen-2, and Gen-3 hardware, but not on Fast Ethernet ports. All port members of the same LAG must have the same value.
unshaped-sap-cir	N/A	Supported	Supported	N/A	Allowed on Gen-2 and Gen-3 hardware, but not on Gen-1 hardware. This means LAGs with Gen-1 members and Gen-2 or Gen-3 members do not allow the unshaped-sap-cir command to be configured to a non-zero value on Gen-2 or Gen-3 ports. LAGs with Gen-2 and Gen-3 members are allowed if all member ports have the same unshaped-sap-cir value. Change the value only on the primary member. The value is propagated to all other members.
shaper-policy	N/A	Supported	Supported	Supported	Allowed on Gen-2 and Gen-3 hardware, but not on Gen-1 hardware. The same restrictions described above for the unshaped-sap-cir command for LAG members apply.
cbs	Supported	Supported	Supported	Supported	Allowed on all hardware generations. All LAG members must have the same value. Change the value only on the primary member. The value is propagated to all other members.
src-pause	Enable or disable	Enable or disable	Disable	Enable or disable	Allowed to change enable/disable on Gen-1, Gen-2, and Gen-3 hardware, except for a Gen-3 port on a 6-port SAR-M Ethernet Module, where only the no src-pause command is supported and cannot be changed. All LAG members must have same value. Change the value only on the primary member. The value is propagated to all other members.
include-fcs	N/A	Enable or disable	Always enabled	Enable or disable	Allowed on Gen-2 and Gen-3 hardware, but not on Gen-1 hardware. The same restrictions described above for the unshaped-sap-cir command for LAG members apply.
scheduler-mode (for port)	Profile or 4-priority	16-priority	16-priority	4-priority	Allowed to configure per-port independently, whether the port is a standalone or an active/standby member. There is no propagation among ports within the same LAG.

Notes:

1. Refers to the 6-port SAR-M Ethernet module.
2. Not supported on Fast Ethernet ports.
3. If the port is in network mode, the **unshaped-if-cir** command can be configured but does not take effect. If the port is in hybrid mode, the command takes effect.

As indicated in [Table 14](#), each generation of adapter card uses its own configured scheduler mode, or uses the only command option available for Gen-2 and Gen-3 adapter cards, whereas Gen-1 adapter cards use their own adapter card configuration. For example, on a LAG where:

- one member link is on Gen-2 hardware
 - this port uses 16-priority scheduler mode, which is the default mode and cannot be changed
- one member link is on Gen-3 hardware
 - this port uses 4-priority (Gen-3) scheduler mode, which is the default mode and cannot be changed
- one member link is on Gen-1 hardware
 - this port uses its configured scheduler mode (profiled or 4-priority), which is dictated via the configuration applied to the port

3.2.14 LAG and ECMP Hashing

If it is necessary to increase the available bandwidth for a logical link that exceeds the physical bandwidth or to add redundancy for a physical link, typically one of two methods is applied: LAG or ECMP. A system can also deploy both at the same time using ECMP of two or more LAGs and/or single links.

The 7705 SAR supports per-flow and per-service hashing, as described in the following sections:

- [Per-Flow Hashing](#)
- [Per-Service Hashing](#)
- [LSR Hashing](#)
- [Layer 4 Load Balancing](#)
- [TEID Hashing for GTP-encapsulated Traffic](#)
- [Entropy Labels](#)



Note: For general information on LAG, see [LAG](#). For general information on ECMP, refer to the 7705 SAR Router Configuration Guide, “Static Routes, Dynamic Routes, and ECMP”.

3.2.14.1 Per-Flow Hashing

The 7705 SAR supports per-flow hashing for LAG and ECMP. Per-flow hashing uses information in a packet as an input to the hash function, ensuring that any given traffic flow maps to the same egress LAG port or ECMP path.

Depending on the type of traffic that needs to be distributed in an ECMP or LAG path, different variables are used as the input to the hashing algorithm that determines the selection of the next hop (ECMP) or port (LAG). The hashing result can be changed using the options described in [Per-Service Hashing](#), [LSR Hashing](#), [Layer 4 Load Balancing](#), [TEID Hashing for GTP-encapsulated Traffic](#), and [Entropy Labels](#).

[Table 15](#) summarizes the possible inputs to the hashing algorithm for ECMP and LAG.

Fragmented packets cannot use Layer 4 UDP/TCP ports or tunnel endpoint IDs (TEIDs). The datapath looks at IP source address and destination address only, even if configured to use Layer 4 UDP/TCP ports or TEID.

In [Table 15](#), the hashing inputs in the Service ID column and the inputs in the other columns are mutually exclusive. Where checkmarks appear on both the per-service and per-flow sides of the table, refer to the table note in the Service ID column to determine when per-service hashing is used.

Table 15 Hashing Algorithm Inputs (ECMP and LAG)

Traffic Type	Per-Service	Per-Flow									
	Service ID	System IPv4 Address ¹	Ingress Port ²	Source and Destination			TEID ⁴	Internal Multicast GroupID ⁵	MPLS Label Stack	Entropy Label	
				MAC Address	IP Address	UDP/TCP Port ³					
ECMP											
IPv4 routed	✓ ⁶	✓			✓	✓	✓	✓			
IPv6 routed	✓ ⁶	✓			✓	✓	✓	✓			
MPLS LSR		✓	✓		✓ ^{7, 8}	✓	✓		✓ ⁹	✓ ⁹	
MPLS MVPN (LSR, eLER)											
VPLS	✓										
Epipe	✓										
Apipe, Cpipe, Fpipe, Lpipe, Hpipe	✓										

Table 15 Hashing Algorithm Inputs (ECMP and LAG) (Continued)

Traffic Type	Per-Service	Per-Flow								
	Service ID	System IPv4 Address ¹	Ingress Port ²	Source and Destination			TEID ⁴	Internal Multicast GroupID ⁵	MPLS Label Stack	Entropy Label
				MAC Address	IP Address	UDP/TCP Port ³				
LAG										
IPv4 routed		✓			✓	✓	✓	✓		
IPv6 routed		✓			✓	✓	✓	✓		
MPLS LSR		✓	✓		✓ ^{7, 8}	✓	✓		✓ ⁹	✓ ⁹
MPLS MVPN (LSR, eLER)		✓	✓		✓			✓	✓	
VPLS	✓ ¹⁰			✓	✓	✓	✓	✓		
Epipe	✓ ¹⁰			✓	✓	✓	✓			
Apipe, Cpipe, Fpipe, Lpipe, Hpipe	✓									

Notes:

1. The system IP address can be included as a hashing input for both IP and LDP ECMP using the **system-ip-load-balancing** command at the system level.
2. Optional hashing input that is included when the **use-ingress-port** command is enabled.
3. Optional hashing input that is included when the **l4-load-balancing** command is enabled (for IP ECMP) or when the hashing algorithm is configured as **lbl-ip-l4-teid** in the **lsr-load-balancing** command (for LDP ECMP). Layer 4 load balancing at the service level is not affected by Layer 4 load balancing at the system, router interface, or service interface levels (IES and VPRN).
4. Optional hashing input that is included when the **teid-load-balancing** command is enabled (for IP ECMP) or when the hashing algorithm is configured as **lbl-ip-l4-teid** in the **lsr-load-balancing** command (for LDP ECMP). TEID load balancing at the service level is not affected by TEID load balancing at the router interface or service interface levels (IES and VPRN).
5. Only applies to multicast traffic. The internal multicast group ID is generated from either the (S,G) record (IGMP snooping, MLD snooping, and PIM snooping), the point-to-multipoint label binding, or the VPLS service creation.
6. Only for Layer 3 traffic going to a Layer 3 spoke SDP interface.
7. Only included when the first nibble after the bottom of stack (BoS) bit is "4", in which case the next header encapsulation is considered to be an IPv4 header.
8. Optional hashing input that is included when LSR hashing is configured as **label-ip**.
9. MPLS label stack and entropy label are mutually exclusive hashing inputs. When an entropy label indicator (ELI) and entropy label (EL) are found in the label stack, the MPLS labels are not used as hashing inputs.
10. Optional hashing input that is included when the **per-service-hashing** command is enabled in a service (VPLS or Epipe). The default setting is disabled, which should be changed to enabled if pre-Release 8.0.R4 behavior is needed.

3.2.14.2 Per-Service Hashing

The 7705 SAR supports load balancing based on service ID, as shown in [Table 15](#). The 7705 SAR uses the service ID as the input to the hash function. Per-service and per-flow hashing are mutually exclusive features.

For IPv4 and IPv6 routed traffic under ECMP operation, the service ID is used as the hashing input for Layer 3 traffic going to a Layer 3 spoke SDP interface. Otherwise, per-flow load balancing is used.

For Epipe and VPLS services under LAG operation, the **per-service-hashing** command and the **l4-load-balancing** and **teid-load-balancing** commands are mutually exclusive. Load balancing via per-service hashing is configured under the **config>service>epipe>load-balancing** and **config>service>vpls>load-balancing** contexts.



Note:

- Prior to Release 8.0.R4 of the 7705 SAR, load balancing for an Epipe service was implicitly defaulted to be enabled (that is, hashing was always on the service ID). Release 8.0.R4 adds the **per-service-hashing** command, which is disabled by default. The **per-service-hashing** command must be explicitly enabled if pre-Release 8.0.R4 behavior is needed.
- Starting with Release 8.0.R4, unless **per-service-hashing** is enabled, a 4-byte hash value will be appended to internal overhead for VPLS multicast traffic at ingress. The egress internal hash value is discarded at egress before scheduling. Therefore, shaping rates at access and network ingress and for fabric policies may need to be adjusted accordingly. In addition, the 4-byte internal hash value may be included in any affected statistics counters.

3.2.14.3 LSR Hashing

LSR hashing operates on the label stack and can also include hashing on the IP header if the packet is an IPv4 packet. The label-IP hashing algorithm can also include the Layer 4 header and the TEID field. The default hash is on the label stack only. IPv4 is the only IP hashing supported on a 7705 SAR LSR.

When a 7705 SAR is acting as an LSR, it considers a packet to be IP if the first nibble following the bottom of the label stack is 4 (IPv4). This allows the user to include an IP header in the hashing routine at an LSR in order to spray labeled IP packets over multiple equal-cost paths in ECMP in an LDP LSP and/or over multiple links of a LAG group in all types of LSPs.

Other LSR hashing options include label stack profile options on the significance of the bottom-of-stack label (VC label), the inclusion or exclusion of the ingress port, and the inclusion or exclusion of the system IP address.



Note: The global IF index is no longer a hash input for LSR ECMP load balancing. It has been replaced with the **use-ingress-port** configurable option in the **lsr-load-balancing** command. As well, the default treatment of the MPLS label stack has changed to focus on the bottom-of-stack label (VC label). In previous releases, all labels had equal influence.

LSR load balancing is configured using the **config>system>lsr-load-balancing** or **config>router>if>lsr-load-balancing** command. Configuration at the router interface level overrides the system-level configuration for the specified interface.

If an ELI is found in the label stack, the entropy label is used as the hash result. Hashing continues based on the configuration of label-only (**lbl-only**), label-IP (**lbl-ip**), or label-IP with Layer 4 header and TEID (**lbl-ip-l4-teid**) options.

3.2.14.3.1 LSR Label-only Hashing

ECMP operation consists of an initial hash based on the system IP address, then on the global port number if the **use-ingress-port** option is enabled.

Each label in the stack is then hashed separately with the result of the previous hash, up to a maximum of 10 labels. The net result is used to select which LDP FEC next hop to send the packet to using a threshold hashing operation of the net result with the number of next hops. Threshold hashing is described in RFC 2992, *Analysis of an Equal-Cost Multi-Path Algorithm*.

If an ELI is found in the label stack, the entropy label replaces the MPLS label stack hashing result and hashing continues.

If the selected LDP or RSVP-TE LSP has its NHLFE programmed with a LAG interface, then a second round of hashing is needed, using the net result of the first round of hashing as the hashing input.

3.2.14.3.2 LSR Label-IP Hashing

In the first round of hashing for LSR label IP hashing, the algorithm parses down the label stack as described in [LSR Label-only Hashing](#).

When the algorithm reaches the bottom of the stack, it checks the next nibble. If the nibble value is 4, the packet is assumed to be an IPv4 packet and the result of the label hash is fed into another hash along with the source and destination address fields in the IP packet header. If the nibble value is not 4, the algorithm will just use the label stack hash already calculated for the ECMP path selection.

The second round of hashing for LAG reuses the net result of the first round of hashing.

3.2.14.3.3 LSR Label-IP Hashing with Layer 4 Header and TEID

If the **lbl-ip-l4-teid** option is configured, the Layer 4 source and destination UDP or TCP port fields and the TEID field in the GTP header are included in the label-IP hashing calculation. See [Layer 4 Load Balancing](#) and [TEID Hashing for GTP-encapsulated Traffic](#) for more information.

3.2.14.3.4 Label Stack Profile Options

The **lsr-load-balancing** command includes a **bottom-of-stack** option that determines the significance of the bottom-of-stack label (VC label) based on which label stack profile option is specified. The profiles are:

- profile 1: favors better load balancing for pseudowires when the VC label distribution is contiguous (default)
- profile 2: similar to profile 1 where the VC labels are contiguous, but provides an alternate distribution
- profile 3: all labels have equal influence in hash key generation

3.2.14.3.5 Ingress Port

The **use-ingress-port** option, when enabled, specifies that the ingress port will be used by the hashing algorithm at the LSR. This option should be enabled for ingress LAG ports because packets with the same label stack can arrive on all ports of a LAG interface. In this case, using the ingress port in the hashing algorithm will result in better egress load balancing, especially for pseudowires.

The option should be disabled for LDP ECMP so that the ingress port is not used by the hashing algorithm. For ingress LDP ECMP, if the ingress port is used by the hashing algorithm, the hash distribution could be biased, especially for pseudowires.

3.2.14.4 Layer 4 Load Balancing

The IP Layer 4 load-balancing option includes the TCP/UDP source and destination port numbers in addition to the source and destination IP addresses in per-flow hashing of IP packets. By including the Layer 4 information, a source address/destination address default hash flow can be subdivided into multiple finer-granularity flows if the ports used between a source address and destination address vary.

Layer 4 load balancing is configured at the system level using the **config>system>l4-load-balancing** command. It can also be configured at the router interface level or the service interface level (IES and VPRN). Configuration at the router interface or service interface level overrides the system-level configuration for the specified interface or service.

For LSR LDP ECMP, Layer 4 load balancing is configured using the **lbl-ip-l4-teid** option in the **lsr-load-balancing command** at the system level or router interface level. Configuration at the router interface level overrides the system-level configuration for the specified interface.

Layer 4 load balancing can also be configured at the service level for Epipe and VPLS services. Layer 4 load balancing at the service level is not impacted by Layer 4 load balancing at the system, router interface, or service interface levels.

3.2.14.5 TEID Hashing for GTP-encapsulated Traffic

GTP is the GPRS (general packet radio service) tunneling protocol. The tunnel endpoint identifier (TEID) is a field in the GTP header. TEID hashing can be enabled on Layer 3 interfaces. The hash algorithm identifies the GTP-U protocol by checking the UDP destination port (2152) of an IP packet to be hashed. If the value of the port matches, the packet is assumed to be GTP-U. For GTPv1 packets, the TEID value from the expected header location is then included in the hash. For GTPv2 packets, the TEID flag value in the expected header is additionally checked to verify whether the TEID is present. If the TEID is present, it is included in the hash algorithm inputs.

TEID load balancing is configured at the router interface level using the **config>router>if>teid-load-balancing** command. It can also be configured at the IES or VPRN service interface level.

For LSR LDP ECMP, TEID load balancing is configured using the **lbl-ip-l4-teid** option in the **lsr-load-balancing command** at the system level or router interface level. Configuration at the router interface level overrides the system-level configuration for the specified interface.

TEID load balancing can also be configured at the service level for Epipe and VPLS services. TEID load balancing at the service level is not impacted by TEID load balancing at the router interface or service interface levels.

3.2.14.6 Entropy Labels

The 7705 SAR supports MPLS entropy labels on RSVP-TE LSPs, as per RFC 6790. The entropy label provides greater granularity for load balancing on an LSR where load balancing is typically based on the MPLS label stack.

If an ELI is found in the label stack, the entropy label is used as the hash result and hashing continues based on the configuration of label-only (**lbl-only**) or label-IP (**lbl-ip**) options. For information on the behavior of LSR hashing when entropy label is enabled, see [LSR Hashing](#).

To support entropy labels on RSVP-TE LSPs:

- the eLER must signal to the ingress node that entropy label capability is enabled, meaning that it (the eLER) can receive and process an entropy label for an LSP tunnel. Entropy labels are supported on RSVP-TE tunnels. Entropy labels are not supported on point-to-multipoint LSPs, BGP tunnels, or LDP FECs.

- the iLER must receive the entropy label capability signal and be configured to enable the insertion of entropy labels for the spoke SDP. Inserting an entropy label adds two labels in the MPLS label stack: the entropy label itself and the ELI.

At the eLER, use the **config>router>rsvp>entropy-label-capability** command to enable entropy label capability on RSVP-TE LSPs.

At the iLER, use the **entropy-label** command to enable the insertion of the entropy label into the label stack. The command is found under the Epipe **config>service>epipe>spoke-sdp** command, and under the VPLS **config>service>vpls>spoke-sdp** and **mesh-sdp** commands.

For details on entropy labels, refer to the “MPLS Entropy Labels” section in the 7705 SAR MPLS Guide.

3.2.15 Automatic Protection Switching

This section contains information on the following topics:

- [APS Overview](#)
- [SC-APS](#)
- [MC-APS](#)
- [K1 and K2 Bytes](#)
- [Revertive Mode](#)
- [APS Tools Commands](#)
- [APS Failure Codes](#)

3.2.15.1 APS Overview

Automatic Protection Switching (APS) allows users to protect a SONET/SDH port or link with a backup (protection) facility of the same speed but from a different adapter card. APS provides protection against a port, signal, or adapter card failure. The 7705 SAR supports 1+1 APS protection in compliance with GR-253-CORE and ITU-T Recommendation G.841 to provide SONET/SDH carrier-grade reliability. All SONET/SDH paths and channels within a SONET/SDH port are protected.

When APS is enabled, the 7705 SAR constantly monitors the health of the APS links, APS ports, and APS-equipped adapter cards. If the signal on the active (working) port degrades or fails, the network proceeds through a predefined sequence of steps to transfer (or switch over) traffic processing to the protection port. This switchover is done very quickly to minimize lost traffic. Traffic is streamed from the protection port until the working port fault is cleared, at which time the traffic may optionally be reverted to the working port.

The 7705 SAR supports 1+1 single-chassis APS (SC-APS) and 1+1 multi-chassis APS (MC-APS). In an SC-APS group, both the working and protection circuit must be configured on the same node, whereas an MC-APS group can be on two separate nodes, providing protection from node failure in addition to protection from link and hardware failure.

Unidirectional and bidirectional modes are supported:

- unidirectional APS (Uni-1Plus1) — in unidirectional mode, only the port in the failed direction switches to the protection port. Unidirectional mode is supported only on SC-APS.
- bidirectional APS — in bidirectional mode, a failure in either direction causes both the near-end and far-end equipment to switch to the protection port in each direction. Bidirectional mode is the default mode and is supported on both SC-APS and MC-APS.

For SC-APS and MC-APS with MEF 8 services where the remote device performs source MAC validation, the MAC address of the channel group in each of the redundant interfaces may be configured to the same MAC address using the **mac** CLI command.

3.2.15.2 SC-APS

In an SC-APS group, both the working and protection circuits terminate on the same node. SC-APS is supported in unidirectional or bidirectional mode on:

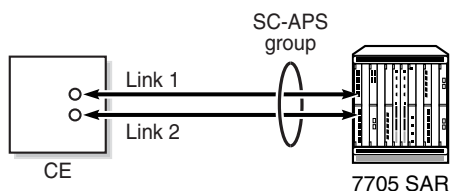
- 2-port OC3/STM1 Channelized Adapter cards for TDM CES (Cpipes) and TDM CESoETH with MEF 8 with DS3/DS1/E1/DS0 channels
- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter cards for MLPPP access ports or TDM CES (Cpipes) and TDM CESoETH (MEF 8) access ports with DS1/E1 channels, or on a network port configured for POS
- 4-port OC3/STM1 Clear Channel Adapter cards network side (configured for POS operation)

SC-APS with TDM access is supported on DS3, DS1, E1, and DS0 (64 kb/s) channels.

The working and protection circuits of an SC-APS group must be on two ports on different adapter cards.

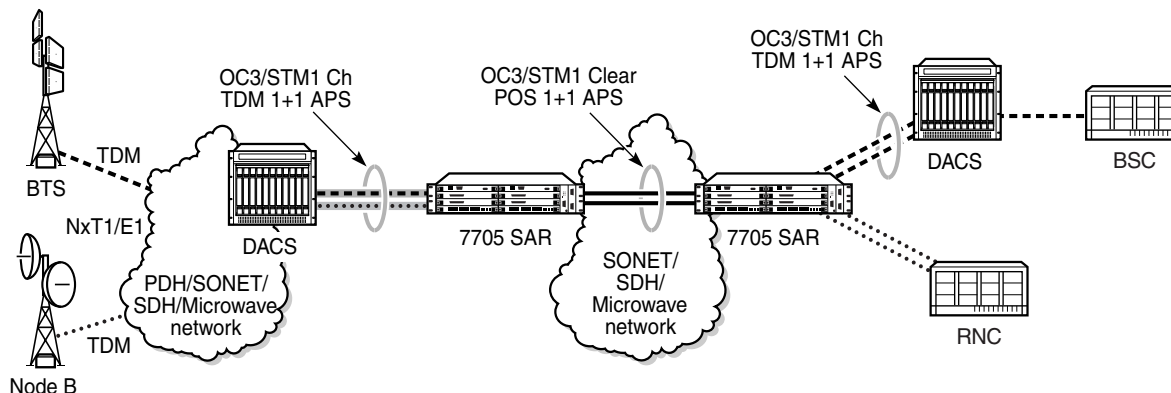
Figure 11 shows an SC-APS group with physical port and adapter card failure protection. Figure 12 shows a packet network using SC-APS.

Figure 11 SC-APS with Physical Port and Adapter Card Protection



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Figure 12 SC-APS Application



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3.2.15.3 MC-APS

MC-APS extends the functionality offered by SC-APS to include protection against 7705 SAR node failure. MC-APS is supported in bidirectional mode on:

- 2-port OC3/STM1 Channelized Adapter cards for TDM CES (Cpipes) and TDM CESoETH with MEF 8 with DS3/DS1/E1/DS0 channels
- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter cards for MLPPP access ports or CES (Cpipes) and TDM CESoETH (MEF 8) access ports with DS1/E1 channels

MC-APS with TDM access is supported on DS3, DS1, E1, and DS0 (64 kb/s) channels. TDM SAP-to-SAP with MC-APS is not supported.

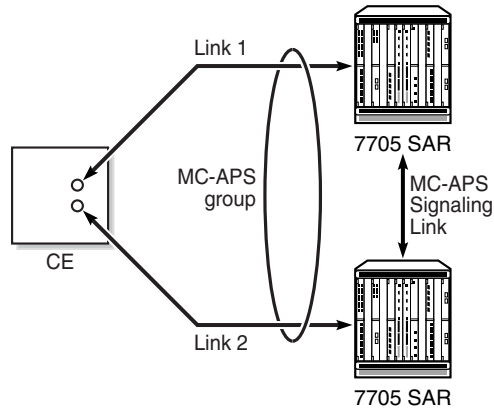
With MC-APS, the working circuit of an APS group can be configured on one 7705 SAR node while the protection circuit of the same APS group is configured on a different 7705 SAR node. The working and protection nodes are connected by an IP link that establishes an MC-APS signaling path between the nodes.

The working and protection circuit must have compatible configurations, such as the same speed, framing, and port type. The circuits in APS group in both the working and protection nodes must also have the same group ID, but they can have different port descriptions. In order for MC-APS to function correctly, pseudowire redundancy must be configured on both the working and protection circuits. For more information, refer to 7705 SAR Services Guide. MC-APS with pseudowire redundancy also supports Inter-Chassis Backup (ICB); see [MC-APS and Inter-Chassis Backup](#) for more information.

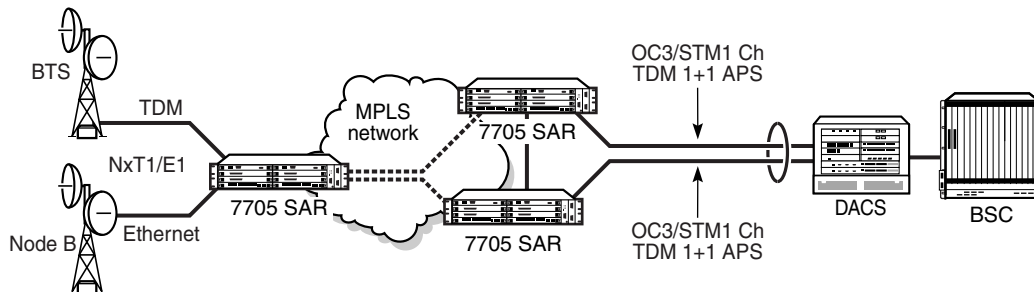
The working and protection nodes can be different platforms, such as a 7705 SAR-8 and a 7705 SAR-18. However, to prevent possible switchover performance issues, it is recommended to avoid mixing different platform types in the same MC-APS group. The 7705 SAR does not enforce configuration consistency between the working circuit and the protection circuit. Additionally, no service or network-specific configuration data is signaled or synchronized between the two routers.

An MC-APS signaling path is established using the IP link between the two routers by matching APS group IDs. A heartbeat protocol can also be used to add robustness. The signaling path verifies that one router is configured as the working circuit and the other is configured as the protection circuit. In case of a mismatch, an incompatible neighbor trap is generated. The protection router uses K1/K2 byte data, member circuit status, and [APS Tools Commands](#) to select the working circuit. Changes in working circuit status are sent across the MC-APS signaling link from the working router to keep the protection router synchronized. External requests such as lockout, force, and manual switches are allowed only on the APS group with the protection circuit.

[Figure 13](#) shows an MC-APS group with physical port, adapter card, and node protection. [Figure 14](#) shows a packet network using MC-APS.

Figure 13 MC-APS with Physical Port, Adapter Card and Node Protection

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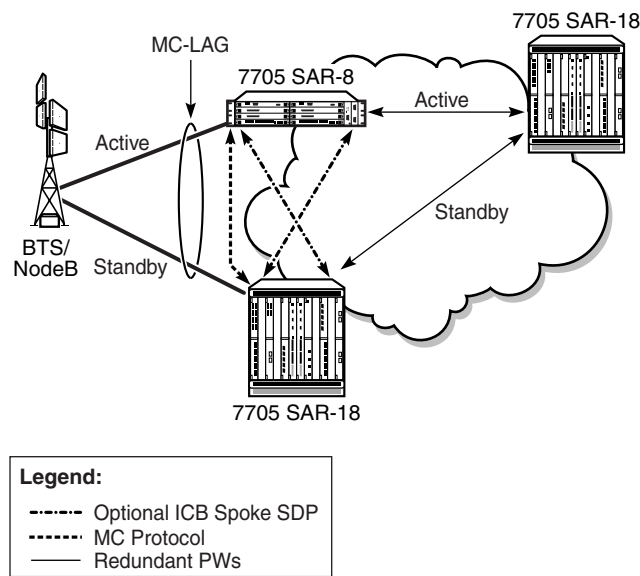
Figure 14 MC-APS Application

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3.2.15.3.1 MC-APS and Inter-Chassis Backup

ICB (Inter-Chassis Backup) spoke SDPs are supported for use with Cpipe services in an MC-APS configuration. ICB improves switch times, provides additional protection in case of network failures, and reduces packet loss when an active endpoint is switched from a failed MC-APS node to the protection node. [Figure 15](#) shows an MC-APS group with pseudowire redundancy and ICB protection.

Figure 15 MC-APS with Pseudowire Redundancy and ICB



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If the active link on the access side fails, MC-APS switchover triggers and subsequently triggers pseudowire redundancy switchover. A failure on the network side triggers pseudowire redundancy switchover but not MC-APS switchover. For detailed information on pseudowire redundancy with ICB protection, refer to 7705 SAR Services Guide, “VLL Services”.

3.2.15.4 K1 and K2 Bytes

The APS protocol uses the K1 and K2 bytes of the SONET/SDH header to exchange commands and replies between the near end and far end.

The switch priority of a request is assigned by bits 1 through 4 of the K1 byte, as shown in Table 16.

Table 16 K1 Byte Switch Priorities

Bits	Condition
1111	Lockout of Protection
1110	Forced Switch
1101	SF - High Priority (not used in 1+1 APS)

Table 16 K1 Byte Switch Priorities (Continued)

Bits	Condition
1100	SF - Low Priority
1011	SD - High Priority (not used in 1+1 APS)
1010	SD - Low Priority
1001	Not used
1000	Manual Switch
0111	Not used
0110	Wait-to-Restore
0101	Not used
0100	Exercise
0011	Not used
0010	Reverse Request
0001	Do Not Revert
0000	No Request

In unidirectional mode, the K1 and K2 bytes are not used to coordinate switch action; however, the K1 byte is still used to inform the other end of the local action, and bit 5 of the K2 byte is set to 0 to indicate 1+1 APS mode (see [Table 17](#)).

In bidirectional mode, the highest-priority local request is compared to the remote request (received from the far-end node using an APS command), and whichever request has the greater priority is selected. The requests can be automatically initiated (such as Signal Failure or Signal Degrade), external (such as Lockout, Forced Switch, Request Switch), or state requests (such as Revert-Time timers).

The channels requesting the switch action are assigned by bits 5 through 8. Only channel number codes 0 and 1 are supported on the 7705 SAR. If channel 0 is selected, the condition bits show the received protection channel status. If channel 1 is selected, the condition bits shows the received working channel status.

The K2 byte is used to indicate bridging actions performed at the line termination equipment (LTE), the provisioned architecture, and mode of operation, as shown in [Table 17](#).

Table 17 K2 Byte Functions

Bits	Function	
1 to 4	—	Channel number codes
5	0	Provisioned for 1+1 mode
	1	Provisioned for 1:n mode
6 to 8	111	Line AIS
	110	Line RDI
	101	Provisioned for bidirectional switching
	100	Provisioned for unidirectional switching
	011	Reserved for future use
	010	Reserved for future use
	001	Reserved for future use
	000	Reserved for future use

3.2.15.4.1 Bidirectional 1+1 APS example

Table 18 outlines the steps that the bidirectional APS process will go through during a typical automatic switching event. The example is read row by row, from left to right, to provide the complete process of the bidirectional switching event.

Table 18 1+1 APS for Bidirectional Mode – Actions Taken

Status	APS Commands Sent in K1 and K2 Bytes on Protection Line		Action	
	B to A	A to B	At Site B	At Site A
No failure (protection line is not in use)	"No request"	"No request"	No action	No action
Working line degraded in direction A to B	"SD" on working channel 1	"No request"	Failure detected, notify A and switch to protection line	No action
Site A receives SD failure condition	Same	"Reverse request"	No action	Remote failure detected, acknowledge and switch to protection line
Site B receives "Reverse request"	Same	Same	No action	No action

3.2.15.5 Revertive Mode

1+1 APS provides revertive and non-revertive modes; non-revertive mode is the default option. In revertive mode, the activity is switched back to the working port after the working line has recovered from a failure (or the manual switch is cleared). In non-revertive mode, a switch to the protection line is maintained even after the working line has recovered from a failure (or the manual switch is cleared).

To prevent frequent automatic switches that result from intermittent failures, a revert-time is defined for revertive switching. The revert-time is configurable from 0 to 60 min in increments of 1 min; the default value is 5 min. In some scenarios, performance issues can occur if the revert-time is set to 0; therefore, it is recommended that the revert-time always be set to a value of 1 or higher. Any change in the revert-time value takes effect upon the next initiation of the wait-to-restore (WTR) timer. The change does not modify the length of a WTR timer that has already been started. The WTR timer of a non-revertive switch can be assumed to be infinite.

If both working and protection lines fail, the line that has less-severe errors will be active. If there is signal degradation on both ports, the active port that failed last will stay active. If there is signal failure on both ports, the working port will always be active because signal failure on the protection line is a higher priority than on the working line.

3.2.15.6 APS Tools Commands

3.2.15.6.1 Lockout Protection

The lockout protection command (**tools>perform>aps>lockout**) disables use of the protection line. Since the command has the highest priority, a failed working line using the protection line is switched back to itself even if it is in a fault condition. No switches to the protection line are allowed when the line is locked out. Refer to the 7705 SAR OAM and Diagnostics Guide, “Tools”, for information on the APS lockout command.

3.2.15.6.2 Request Switch of Active to Protection

The request or manual switch of active to protection command (**tools>perform>aps> request**) switches the active line to use the protection line (by issuing a manual switch request) unless a request of equal or higher priority is already in effect. If the active line is already on the protection line, no action takes place. Refer to the 7705 SAR OAM and Diagnostics Guide, “Tools”, for information on the APS request command.

3.2.15.6.3 Request Switch of Active to Working

The request or manual switch of active to working command (**tools>perform>aps>request**) switches the active line back from the protection line to the working line (by issuing a manual switch request) unless a request of equal or higher priority is already in effect. If the active line is already on the working line, no action takes place. Refer to the 7705 SAR OAM and Diagnostics Guide, “Tools”, for information on the APS request command.

3.2.15.6.4 Forced Switch of Working to Protection

The forced switch of working to protection command (**tools>perform>aps>force**) switches the active line to the protection line (by issuing a forced switch request) unless a request of equal or higher priority is already in effect. When the forced switch of working to protection command is in effect, it may be overridden either by a lockout of protection command or by detecting a signal fault on the protection line. If the active line is already on the protection line, no action takes place. Refer to the 7705 SAR OAM and Diagnostics Guide, “Tools”, for information on the APS force command.

3.2.15.6.5 Forced Switch of Active to Working

The forced switch of active to working command (**tools>perform>aps>force**) switches the active line back from the protection line to the working line (by issuing a forced switch request) unless a request of equal or higher priority is already in effect. Refer to the 7705 SAR OAM and Diagnostics Guide, “Tools”, for information on the APS force command.

3.2.15.6.6 Exercise

The exercise command (**tools>perform>aps>exercise**) is only supported in 1+1 APS bidirectional mode. The Exercise command exercises the protection line by sending an exercise request over the protection line to the far end and expecting a reverse request response back. The switch is not completed during the exercise routine. Refer to the 7705 SAR OAM and Diagnostics Guide, “Tools”, for information on the APS exercise command.

3.2.15.7 APS Failure Codes

3.2.15.7.1 Protection Switching Byte Failure (APS-PSB)

This failure indicates that the received K1 byte is either invalid or inconsistent. An invalid code defect occurs if the same K1 value is received for three consecutive frames and is either an unused code or irrelevant for the specific switching operation. An inconsistent code defect occurs when no 3 consecutive received K1 bytes of the last 12 frames are the same.

If the failure persists for 2.5 s, a Protection Switching Byte alarm is raised. When this failure is declared, the protection line is treated as if it were in the SF state. The received signal is then selected from the working line.

When the failure is absent for 10 s, the alarm is cleared and the SF state of the protection line is removed.

This alarm can only be raised by the active port operating in bidirectional mode.

3.2.15.7.2 Channel Mismatch Failure (APS-CM)

This failure indicates that there is a channel mismatch between the transmitted K1 bytes and the received K2 bytes. A defect is declared when the received K2 channel number differs from the transmitted K1 channel number for more than 50 ms after 3 identical K1 bytes are sent. The monitoring for this condition is continuous, not just when the transmitted value of K1 changes.

If the failure persists for 2.5 s, a Channel Mismatch Failure alarm is raised. When this failure is declared, the protection line is treated as if it were in the SF state. The received signal is then selected from the working line.

When the failure is absent for 10 s, the alarm is cleared and the SF state of the protection line is removed.

This alarm can only be raised by the active port operating in bidirectional mode.

3.2.15.7.3 APS Mode Mismatch Failure (APS-MM)

This failure can occur for two reasons. The first reason is that the received K2 byte indicates that 1:N protection switching is being used by the far end of the OC-N line, rather than 1+1 protection switching. The second reason is that the received K2 byte indicates that unidirectional mode is being used by the far end while the near end is using bidirectional mode. This defect is detected within 100 ms of receiving a K2 byte that indicates either of these conditions.

If the failure persists for 2.5 s, a Mode Mismatch Failure alarm is raised. When this failure is declared, if the defect indicates that the far end is configured for unidirectional mode, then the OC-N port reverts from its current bidirectional mode to unidirectional mode. However, the port continues to monitor the received K2 byte, and if the K2 byte indicates that the far end has switched to bidirectional mode, the OC-N port then reverts to bidirectional mode as well. The monitoring stops if the user explicitly reconfigures the local port to operate in unidirectional mode.

When the failure is absent for 10 s, the alarm is cleared, and the configured mode, which is 1+1 bidirectional, is used.

This alarm can only be raised by the active port operating in bidirectional mode.

3.2.15.7.4 Far-End Protection Line Failure (APS-FEPL)

This failure occurs when a K1 byte is received in three consecutive frames that indicates a signal fail (SF) at the far end of the protection line. This failure forces the received signal to be selected from the working line.

If the failure persists for 2.5 s, a Far-End Protection Line Failure alarm is raised. This alarm can only be raised by the active port operating in bidirectional mode. When the failure is absent for 10 s, the alarm is cleared.

3.2.16 Deploying Preprovisioned Components

When a CSM or adapter card is installed in a preprovisioned slot, the system tests for discrepancies between the preprovisioned card and card type configurations and the types actually installed. Error messages are displayed if there are inconsistencies, and the card will not initialize. When the proper preprovisioned cards are installed into the appropriate chassis slot, then alarm, status, and performance details will be displayed on the CLI.

3.2.17 Microwave Link

This section contains information on the following topics:

- [Microwave Link Overview](#)
- [Standalone Mode](#)
- [Single NE Mode](#)
- [Frequency Synchronization](#)

3.2.17.1 Microwave Link Overview

A microwave link allows a 7705 SAR-8 or 7705 SAR-18 to be connected to a 9500 MPR-e radio node. The MPR-e is the zero-footprint (outdoor) microwave solution offered by Nokia that allows customers to migrate from TDM microwave to pure packet microwave. The following MPR-e radio variants are supported:

- MPT-MC - Microwave Packet Transport, Medium Capacity (ODU)
- MPT-HC V2/9558HC - Microwave Packet Transport, High Capacity Version 2 (ODU)
- MPT-XP - Microwave Packet Transport, High Capacity (very high power version of the MPT-HC V2/9558HC) (ODU)
- MPT-HQAM - Microwave Packet Transport, High Capacity (MPT-HC-QAM) or Extended Power (MPT-XP-QAM) with 512/1024 QAM (ODU)
- MPT-HLC - Microwave Packet Transport, High-Capacity Long-Haul Cubic (ANSI) (IDU)

A microwave link is configured on a 7705 SAR-8 or 7705 SAR-18 as a virtual port object (not as a physical port) using the CLI command **mw-link-id** (for more information on how to configure a microwave link, see [Microwave Link Commands](#)).



Note: Before a microwave link can be configured, the current 7705 SAR software package that includes the MPR-e radio software must be downloaded from OLCS to the 7705 SAR-8 or 7705 SAR-18. See [MPR-e Radio Software and Upgrade Management](#) for more information.

The supported microwave link types are 1+0 and 1+1 Hot Standby (HSB). To deploy an N+0 link (with $N \geq 2$), multiple links of 1+0 can be configured separately.

A microwave link connection is made from ports 1 through 4 on a Packet Microwave Adapter card to an MPR-e radio using one of the methods described in the 7705 SAR Packet Microwave Adapter Card Installation Guide, “Delivering Data to an MPR-e Radio”. The radio can be configured in standalone mode to provide a basic microwave connection as described in [Standalone Mode](#) or in Single Network Element (Single NE) mode to provide the advanced networking capabilities described in [Single NE Mode](#). The default configuration is Single NE mode.

When connected to an MPR-e radio, these ports, with microwave link configured, operate as Gigabit Ethernet ports and provide the same features as the other ports (ports 5 through 8), except for the following:

- 802.1x authentication
- active/standby operation on Ethernet access ports configured as LAGs
- hard policing on Ethernet ports

If a microwave link is not configured on ports 1 through 4, they provide all of the same features as the other Gigabit Ethernet ports (ports 5 through 8).

3.2.17.2 Standalone Mode

A microwave link from ports 1 through 4 on a Packet Microwave Adapter card to an MPR-e radio that is configured in standalone mode provides a basic microwave connection to the MPR-e radio. In standalone mode, each MPR-e radio that is connected to a 7705 SAR-8 or 7705 SAR-18 is managed as a separate standalone NE by the MPT Craft Terminal (MCT) Element Manager.

3.2.17.3 Single NE Mode

A microwave link from ports 1 through 4 on a Packet Microwave Adapter card to an MPR-e radio that is configured in Single NE mode provides the following networking capabilities to the radio over the microwave link:

- [Single NE Management](#)
- [Microwave Link Fast Fault Detection \(FFD\)](#)
- [1+1 HSB](#)

3.2.17.3.1 Single NE Management

MWA allows the 7705 SAR-8 or 7705 SAR-18 and the MPR-e radios to which it is connected to be integrated and managed as a Single NE. The following features are part of Single NE management:

- [One Management IP Address](#)
- [MPR-e Radio Configuration Management](#)
- [MPR-e Radio Alarm Management](#)
- [MPR-e Radio Software and Upgrade Management](#)
- [MPR-e Radio Configuration Database File Management](#)
- [MPR-e Radio Inventory and Microwave Link Performance Statistics](#)
- [MPR-e Radio Reset Control](#)
- [MPR-e Radio Mute Control](#)

One Management IP Address

The individual management and IP address of the MPR-e radios are no longer required for network management. When managing a microwave network (consisting of a 7705 SAR-8 or 7705 SAR-18 that is connected to one or more MPR-e radios) using an element/network manager, only the IP address of the 7705 SAR-8 or 7705 SAR-18 needs to be entered. This capability optimizes the microwave network's IP addressing plan.

MPR-e Radio Configuration Management

For an MPR-e configuration, the required MWA-specific parameters are configured on the 7705 SAR side using the CLI and the required non-MWA parameters are configured on the MPR-e side using the MCT.

The following MWA-specific parameters are configured on the 7705 SAR side:

- 1+1 HSB parameters
- Epipe VLAN SAP parameters (in a mixed microwave link scenario, where there is interworking between a 7705 SAR MPR-e system and an MSS 9500 MPR system using a TDM2Ethernet service, specific MPR-e system parameters are configured under the Epipe VLAN SAP; for more information, refer to the 7705 SAR Services Guide, "Configuring Epipe SAP Microwave Link Parameters for Interworking with TDM2 Ethernet").

The following parameters are configured on the MPR-e side:

- radio link parameters
- QoS classification parameters

Configuration done on the MPR-e side is collected in a configuration file; this file can be saved to a 7705 SAR-8 or 7705 SAR-18 using the Commit button function on the MCT or an **admin>save** CLI command on the 7705 SAR-8 or 7705 SAR-18.

MPR-e Radio Alarm Management

An MPR-e radio generates alarms for fault conditions pertaining to the MPR-e hardware and to the microwave link over which it is connected. The alarms are sent to the 7705 SAR-8 or 7705 SAR-18, which turns the alarm notifications into SNMP traps and log events. These log events are controlled in the same way as all other events on the 7705 SAR-8 and 7705 SAR-18 and can be displayed using the **show>log>event-control>mwmgr** command. Refer to the 7705 SAR System Management Guide, “Event and Accounting Logs”, for more information.

MPR-e Radio Software and Upgrade Management

The Single NE capability optimizes the MPR-e radio software installation and upgrade process. The MPR-e radio software is bundled with the 7705 SAR software as one package, there is no need to look for and download the MPR-e radio software separately. The 7705 SAR software package containing the MPR-e radio software can be downloaded from a directory on OLCS. The operator can copy the software package onto a compact flash or network store on the 7705 SAR-8 or 7705 SAR-18.



Note: There are two TiMOS .zip files on OLCS that contain the current 7705 SAR software package; the file that contains the MPR-e radio software has the .MWA annotation in the filename. Only the MPR-e radio software that is bundled with this 7705 SAR software package is recognized as being valid by the 7705 SAR-8 or 7705 SAR-18.

MPR-e Radio Configuration Database File Management

An MPR-e radio's database file is stored and backed up on a 7705 SAR-8 or 7705 SAR-18. If an old MPR-e radio is replaced by a new one, the new MPR-e radio downloads the MPR-e radio software from the 7705 SAR-8 or 7705 SAR-18, along with the backed-up database file of the old MPR-e radio. This means that the MPR-e radio does not need to be reconfigured after a radio hardware replacement.

A separate database file is required for each managed MPR-e radio. The user specifies the filename of the database file to be used during provisioning of the radio on the 7705 SAR-8 or 7705 SAR-18 using the **config>port>mw>radio>database** CLI command.

MPR-e Radio Inventory and Microwave Link Performance Statistics

The following MPR-e radio system information and microwave link information and statistics can be accessed through a CLI session on the 7705 SAR-8 or 7705 SAR-18:

- MPR-e radio system information
 - equipment type
 - inventory information
 - radio frequency band
 - temperature
 - radio transmit status
- microwave link statistics
 - MPR-e radio Ethernet statistics
 - local Tx power
 - local Rx power
 - remote Tx power
 - remote Rx power



Note: Local/remote Rx power monitoring and local/remote Tx power monitoring are also known as Receive Signal Level (RSL) monitoring and Transmit Signal Level (TSL) monitoring, respectively.

MPR-e Radio Reset Control

MPR-e radio reset control is provided on the 7705 SAR-8 or 7705 SAR-18. During an MPR-e radio reset, the microwave link is brought down and an upper layer applications action is triggered, such as message rerouting and clock source switching by the System Synchronization Unit (SSU).

MPR-e Radio Mute Control

MPR-e radio mute control can be enabled through the CLI/SNMP or by using the MCT. The MCT and CLI are synchronized to show the current state of the MPR-e radio mute function.



Note: Administratively disabling the microwave link with which the MPR-e radio is associated (using the **config>port>mw-link-id>shutdown** command) causes the main and spare MPR-e radios to be muted.

3.2.17.3.2 Microwave Link Fast Fault Detection (FFD)

The microwave link Fast Fault Detection (FFD) capability allows a 7705 SAR-8 or 7705 SAR-18 to directly detect MPR-e radio or microwave link faults using proprietary messaging. The following fault types are detected by FFD:

- a radio signal failure
- an MPR-e radio hardware failure
- an incompatible MPR-e radio setting
- a High Bit Error Rate (HBER) condition
- a Remote Defect Indication (RDI) condition



Note:

- FFD does not cause the SSU to disqualify the microwave link as a clock source if a fault condition is detected; SSM must be enabled in order to provide this function.
- The microwave link hold time (hold-up time and hold-down time) must be configured in order to suppress link flapping. The hold-up and hold-down times delay advertising the transition of the microwave link status to the upper layer applications, including IP/MPLS and SSU. The hold-time range is between 0 and 900 s.

If microwave link faults are detected, an event is logged and the link is disabled. Some detected faults may be selectively suppressed using the **suppress-faults** command. When faults are suppressed, the event is still logged, but the microwave link is not disabled. Operators can suppress HBER faults, RSL threshold crossing faults, and/or RDI faults. By default, the system does not suppress faults for FFD.

3.2.17.3.3 1+1 HSB

MWA uses 1+1 HSB to protect against microwave link, MPR-e radio, and Packet Microwave Adapter card failures, as well as frequency channel selective fading. Additionally, hitless (errorless) switching provides zero packet loss if a switchover occurs from a main to a spare MPR-e radio.

The following are required for 1+1 HSB:

- one frequency channel
- two MWA Gigabit Ethernet ports (configured in network mode) on two different Packet Microwave Adapter cards installed in adjacent slots (for example, slot 1/2 or slot 5/6); port 1 on one card protects port 1 on the adjacent card, port 2 protects port 2 on the adjacent card, and so on.
- two MPR-e radios (one main and one spare), each connected to one of the MWA Gigabit Ethernet ports on a Packet Microwave Adapter card



Note: An MPR-e radio that is connected to an odd-numbered port on the Packet Microwave Adapter card must be configured as the main radio.

The following protection schemes make up 1+1 HSB:

- [1+1 Equipment Protection Switching \(EPS\)](#)
- [1+1 Transmission Protection Switching \(TPS\)](#)
- [1+1 Radio Protection Switching \(RPS\)](#)
- [1+1 HSB Transmit Diversity Antenna \(TDA\)](#)

These protection schemes are enabled using the **config>port>mw>protection** command, with the exception of Transmit Diversity Antenna, which is enabled via the MCT. They interwork with each other as described in the sections that follow.

1+1 Equipment Protection Switching (EPS)

EPS protects against MPR-e radio, MWA Gigabit Ethernet link, and Packet Microwave Adapter card failures. After the radio frames are processed by the active EPS MPR-e radio, the radio sends the Ethernet traffic down to the 7705 SAR-8 or 7705 SAR-18. The standby EPS MPR-e radio does not send any Ethernet traffic down to the 7705 SAR-8 or 7705 SAR-18.

The switching criteria for EPS are:

- an MPR-e radio hardware failure

- an MWA Gigabit Ethernet link failure between the 7705 SAR-8 or 7705 SAR-18 and an MPR-e radio
- a Packet Microwave Adapter card connected to an active EPS MPR-e going into a missing or failure state

1+1 Transmission Protection Switching (TPS)

In a 1+1 HSB configuration, TPS protects against a microwave link transmission failure by ensuring that only one MPR-e radio at a time uses the antenna for signaling. The 7705 SAR-8 or 7705 SAR-18 sends traffic to both the active and standby TPS MPR-e radios. Upon receiving the baseband traffic, both radios modulate it and up-convert it to signals. However, only the active TPS MPR-e radio transmits the RF signals; the standby TPS MPR-e radio suppresses the signals. When the active TPS MPR-e radio fails, standby radio becomes active and restores the microwave link channel.

The switching criteria for TPS are identical to EPS.

Note:



- The state of the EPS and TPS MPR-e radios are linked to each other. If an alarm occurs, an automatic switchover for EPS and TPS is activated simultaneously. However, if a manual switchover is configured, the switchover is decoupled and the state of the EPS and TPS MPR-e radios is no longer identical.
- A manual switchover can be configured for EPS but not for TPS.

1+1 Radio Protection Switching (RPS)

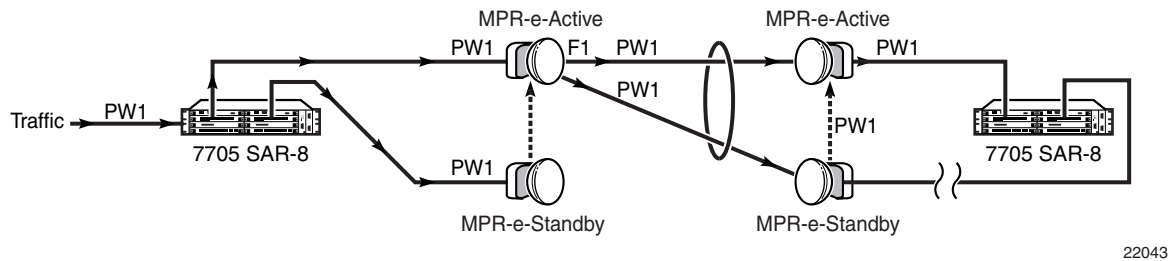
RPS is a hitless radio function that provides space diversity protection for the microwave channel. On the receive side, each MPR-e radio monitors the same radio frequency channel, with the main MPR-e radio being the active receiver by default. Both active and standby RPS MPR-e radios receive both streams of radio frames. The standby RPS MPR-e radio sends the stream of radio frames that it receives to the active EPS MPR-e radio.

Note: In order to provide space diversity (SD) for the two radio frequency channels, RPS requires that a separate antenna be mounted for each MPR-e radio.



Figure 16 shows a typical application of 1+1 HSB with SD deployment. Only one microwave frequency channel is active and only the main MPR-e radio is transmitting data to the remote ends; the spare MPR-e radio is acting as a standby.

Figure 16 1+1 HSB with SD Deployment



1+1 HSB Transmit Diversity Antenna (TDA)

The TDA feature provides another layer of protection over a microwave link. The TDA configuration uses a main antenna mounted on one MPT-HLC radio and a diversity antenna mounted on another MPT-HLC radio. In combination with the 1+1 HSB radio configuration (redundant MPR-e radios), the traffic is transmitted on either the main antenna or the diversity antenna to achieve the Space Diversity (SD) receiver configuration.

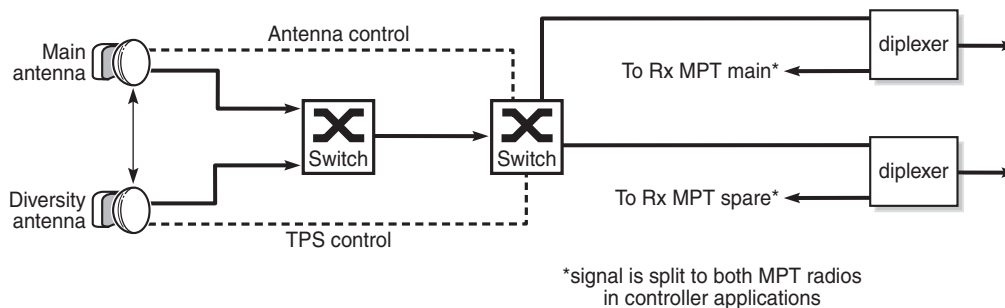
TDA provides protection switching independent of TPS. TDA is capable of counter-acting either negative propagation conditions or permanent antenna failure.

The main antenna is the default main unit that controls the antenna traffic flow using the TDA algorithm. If the main unit fails, the TDA algorithm is no longer operational on the main unit; its transmission switches over to the diversity antenna.

The non-operation of the main antenna switch does not affect transmission, even while the TDA algorithm is being transmitted on the diversity antenna.

TDA configuration is done via the MCT. TDA status is available using the 7705 SAR CLI/SNMP and via the MCT. The CLI command that is used is **show>mw>link**. The status information includes the current TDA configuration, which antenna is active, and the active antenna position.

Figure 17 shows an example of a TDA application.

Figure 17 Example of a TDA Application

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Communication Method Between the Main and Spare MPR-e Radio

In a 1+1 HSB configuration, the communication path between the main (active) and spare (standby) MPR-e radios installed on a tower is set up using a tight cable.



Note: A tight cable is required with MPT-HC V2, MPT-XP, MPT-HLC, and MPT-QAM radios (1+ 1 HSB is not supported on MPT-MC radios).

3.2.17.3.4 1+1 Switching Operation

The following list defines the types of EPS, TPS, and RPS MPR-e radio switching operations that can be enabled using the **tools>perform>mw>link** command. Refer to the 7705 SAR OAM and Diagnostics Guide, “Tools Command Reference”, “Tools Perform Commands”, for more information.



Note: TDA switching operation is enabled via the MCT.

- **lockout**—prevents the spare MPR-e radio from ever becoming the main radio, even when the main MPR-e radio fails; this operation overrides any forced, automatic, or manual operation
- **forced** —forces the spare MPR-e radio to become the main MPR-e radio, even though it might not be in a fit state to assume the role. A forced switch operation overrides any automatic or manual switch operation that is in place.

- automatic—allows an MPR-e radio to perform an automatic switchover if a fault condition exists. An automatic switch operation overrides any manual switch operation that is in place.
- manual—attempts to switch the main/spare status of an MPR-e radio; however, if port failures, equipment failures, and reception failures do not allow the switchover, an automatic switch operation is triggered.

You can also configure revertive switching for RPS and EPS/TPS (when revertive switching is configured for EPS, it is also applied to TPS; revertive switching for TPS cannot be configured separately). Revertive switching occurs when the MPR-e radio operation switches from the spare radio back to the main radio after a fault condition is cleared.

3.2.17.4 Frequency Synchronization

Depending on the type of Gigabit Ethernet microwave link used to connect the Packet Microwave Adapter card and an MPR-e radio, different frequency synchronization mechanisms can be used.

When using optical 1000Base-SX to connect the Packet Microwave Adapter card and an MPR-e radio, synchronous Ethernet and SSM are the frequency synchronization mechanisms that are used. SSM is used as the mechanism to detect a microwave link failure, including loss of frame and MPR-e radio hardware failure.

When using electrical 1000Base-T to connect the Packet Microwave Adapter card and an MPR-e radio, PCR is the frequency synchronization mechanism that is used (a copper SFP is mandatory on ports 3 and 4).

For more information on PCR, synchronous Ethernet, and SSM, refer to the 7705 SAR Basic System Configuration Guide, “Node Timing”.

3.2.17.5 RSL History

An MPR-e radio that is connected to the 7705 SAR can automatically upload its received signal level (RSL) history file to the 7705 SAR host. The RSL file contains a history of radio attributes and alarms that radio operators can use to isolate and diagnose radio-layer problems that might exist in the network.

Up to 24 MPR-e radios can independently upload their RSL history file every 15 minutes when the **rsl-history** command is configured on the 7705 SAR for each radio. When uploaded, the file is stored on the 7705 SAR compact flash. Each RSL file can be up to 1 Mbyte and contain up to 10 000 lines. Each time a new file from a specific MPR-e radio is sent to the 7705 SAR, the new file overwrites the previous version for that radio. Once uploaded to the 7705 SAR, the operator can view the file in its raw format using the **file>type** command or FTP it to an external server.

Table 19 lists the attributes in the RSL history file.

Table 19 RSL History Attributes

Attribute	Description
Time	Time of record
LocTxPower	Local transmit power
RemTxPower	Remote transmit power
LocRxPower	Local received power
RemRxPower	Remote received power
LocDivRxPower	Local diversity received power (significant for diversity configuration only)
RemDivRxPower	Remote diversity received power (significant for diversity configuration only)
LocXPD	Local cross-polar discrimination (significant for XPIC configuration only)
RemXPD	Remote cross-polar discrimination (significant for XPIC configuration only)
LocMSE	Local mean squared error
RemMSE	Remote mean squared error
TxMod	Transmitter modulation
RxMod	Receiver modulation
LocEPS	Local equipment protection switching
RemEPS	Remote equipment protection switching
LocRPS	Local radio protection switching
RemRPS	Remote radio protection switching
LocTPS	Local transmit protection switching

Table 19 RSL History Attributes (Continued)

Attribute	Description
RemTPS	Remote transmit protection switching
LocHBERAlm	Local high bit error rate alarm
RemHBERAlm	Remote high bit error rate alarm
LocEWAIm	Local early warning alarm
RemEWAIm	Remote early warning alarm
LocDemFailAlm	Local demodulation failure alarm
RemDemFailAlm	Remote demodulation failure alarm

3.2.18 DSL Bonding

This section contains information on the following topics:

- [DSL Bonding Overview](#)
- [ATM Bonding](#)
- [PTM Bonding](#)
- [Pairs Within a Bonded Group](#)
- [Configuration](#)
- [Layer 3 Protocol Support and Service Provisioning](#)

3.2.18.1 DSL Bonding Overview

The 7705 SAR-M (variants with module slots) supports two DSL modules designed to transport high-volume, best-effort HSDPA traffic or to be used as a pure DSL backhaul option. The 6-port DSL Combination module supports four G.SHDSL.bis pairs and two ADSL2, ADSL2+, or VDSL2 pairs. The 8-port xDSL module supports eight pairs of ADSL2, ADSL2+, or VDSL2.

The 7705 SAR-Wx variants that support Ethernet and xDSL each provide 4-pair xDSL PTM bonding (ADSL2+ or VDSL2) on the RJ-45 xDSL port. Refer to the 7705 SAR-Wx Chassis Installation Guide for more information on the xDSL port on the 7705 SAR-Wx.

DSL bonding allows multiple physical DSL links to be combined in one logical link to increase bit rate capacity to the subscriber and/or extend the reach of existing services. DSL bonding is activated by the handshake messages between the Central Office and CPE as defined in ITU-T G.994.1. Once the port is configured for bonded mode, any pairs not included in the bonded groups cannot be used to carry traffic.

The 6-port DSL Combination module supports up to two bonding groups, one for SHDSL and one for xDSL. The 8-port xDSL module and the RJ-45 xDSL port on the 7705 SAR-Wx support only one bonding group. The DSLAM handshake determines the number of DSL pairs used in each bonding group as shown in [Table 20](#).

Table 20 DSL Pairs by Bonding Group

Bonding Group	6-port DSL Combination Module DSL Pairs	8-port xDSL Module DSL Pairs	7705 SAR-Wx RJ-45 xDSL Port DSL Pairs
xDSL PTM	1 to 2	1 to 8	1 to 4
SHDSL	2 to 4	—	—
ADSL2/ADSL2+ ATM	1 to 2	1 to 2	—

Bonding functions are driven entirely by the Central Office with the exception of the ATM VPI/VCI when ATM bonding is used on an xDSL interface.

The 7705 SAR-M supports both ATM and PTM bonding. The 7705 SAR-Wx supports PTM bonding.

3.2.18.2 ATM Bonding

ATM bonding is specified by ITU-T G.998.1 and is used for ATM-based transmission links for all types of ADSL. ATM bonding adds sequence information to ATM cells, allowing resequencing by adding delay variation to account for speed differences across multiple physical links in one bonding group. ATM bonding is sometimes referred to as multi-ADSL bonding because multiple ADSL lines typically use ATM-based transmission links.

ATM bonding acts as an alternative to IMA as a method of logically combining multiple lines transmitting ATM cells. ATM bonding differs from IMA in the following ways:

- ATM links can run at different rates
- differential delay does not need to be constant, but should be controlled to minimize buffering requirements
- the traffic header of transported ATM cells is modified to carry a sequence ID
- traffic is distributed to the links at the discretion of the transmitter, rather than strict round-robin order

The 8-port xDSL module and the xDSL interface of the 6-port DSL Combination module support 2-pair ATM bonding for ADSL2 and ADSL2+. When operating in ATM bonded mode, the remaining 6 pairs on the 8-port xDSL module cannot be used. Additionally, the only protocol stack supported is Ethernet over ATM with RFC 2684 LLC/SNAP bridged ATM packets. In ATM bonded mode, cell scrambling is always enabled and ATM CLP is disregarded (it is not set or inspected for priority loss indications). Any packet priority marking must be done at the Ethernet, MPLS, or IP layers.

In ATM channel-bonding schemes, the end-user packets are split into 53-byte cells. Each cell is tagged with a sequence ID by replacing bits in the ATM header with sequence ID (SID) bits between bonding entities. The ATM bonding implementation on the 7705 SAR-M currently only supports a 12-bit SID, although G.998.1 specifies support for either an 8-bit or 12-bit SID bound by the aggregate rate, differential delay, and number of links.

For ATM bonding, all bridged PDUs are sent without an FCS field. However, if an attached DSLAM does send bridged PDUs with an FCS field attached, the FCS is honored and is not removed or regenerated.

3.2.18.3 PTM Bonding

PTM bonding is specified by ITU-T G.998.2 and is supported on VDSL2, ADSL2, and ADSL2+ interfaces on the 6-port DSL Combination module and 8-port xDSL module, and on SHDSL on the 6-port DSL Combination module. The 7705 SAR-Wx variants that support Ethernet and xDSL provide 4-pair xDSL PTM bonding (ADSL2+ or VDSL2) on the RJ-45 xDSL port.

PTM bonding and EFM bonding are sometimes used interchangeably, with EFM bonding generally used in conjunction with SHDSL. The SHDSL interface on a 6-port DSL Combination module complies with both PTM specified in ITU-T G.998.2, and EFM specified in IEEE 802.3ah-2004.

PTM bonding applies to DSL links with or without identical transmission speeds. Since PTM implies the use of variable-size PDUs, it makes the use of IMA techniques impossible. PTM bonding combines EFM-based transmission links with limited, or reach-dependent, bandwidth, specifically VDSL2, SHDSL, or ADSL2+ on the 7705 SAR-M and ADSL2+ or VDSL2 on the 7705 SAR-Wx. PTM bonding adds sequence information to transmitted frames or frame fragments, allowing resequencing by adding delay variation to account for speed and PDU size differences across multiple physical links in one bonding group.

In PTM channel-bonding schemes, the end-user packets are split into small fragments of up to 512 bytes. The PTM bonding implementation on xDSL ports uses a fixed fragment size of 204 bytes, which is not user-configurable. The PTM fragment size on the SHDSL ports is set to 256 bytes. When PTM bonding is active on a DSL bundle, fragments are distributed over individual DSL lines. At the receiving end, the fragments are realigned to recover from differential delays in the transmission path, then reassembled into packets.

In order to realign correctly, each fragment is prefixed with a header containing a sequence identifier (SID), a start of packet (SOP) indicator, and an end of packet (EOP) indicator. The receiver side uses the SID to rearrange the incoming cells in the correct order, while the SOP and EOP indications are used to reassemble the stream of cells into complete data packets. If transmitted Ethernet packets are smaller than the PTM fragment size, they are transmitted inside a single fragment.

3.2.18.4 Pairs Within a Bonded Group

Pairs within a bonded group must start with pair 1 and are then sequentially added into each module or port. For example, if a 4-pair bonded group is desired on an interface capable of supporting 4 or more pairs, pairs 1 through 4 should be connected to the DSLAM and configured by the DSLAM into the bonded group. For pinout diagrams, refer to the 7705 SAR DSL Module Installation Guide for RJ-11 pinouts and the 7705 SAR-Wx Chassis Installation Guide for RJ-45 pinouts.

On the ISAM, bonding makes use of either chipset or LT-level (Line Termination card-level) bonding. For LT-level bonding, the interworking function on the LT board allows non-contiguous ports on the same LT to be bonded. LT-level bonding is used to configure 8-pair bonding on the ISAM, which is also handled by dedicated hardware that incorporates both bonding and xDSL interworking functions. SHDSL bonding functions are provided on the ISAM via chipset level bonding.

Within a bonding group, the line used to identify the whole group is referred to as the primary link. The other lines in the bonding group are referred to as secondary or slave links. The supported bit rate over the bonding group is the sum of the actual net bit rates on all lines in the group.

3.2.18.5 Configuration

All DSL ports are considered the functional equivalent of an Ethernet port and support many of the same features and configuration commands. Data from the router's central network processor transmit and receive Ethernet packets to and from the 7705 SAR-M module slot or 7705 SAR-Wx port.

If xDSL lines train in ATM bonding mode over ADSL2/2+, the VPI/VCI configured on that port is used by the module or platform to interwork Ethernet packets into AAL5 LLC snap-bridged PDUs without user intervention.

All lines for both the 6-port DSL Combination module and the 8-port xDSL module are configured from the ISAM via the G.994.1 (G.hs) handshake. All lines operate in auto-detect mode; therefore, there are no individual line configurations required with the exception of the configuration of VPI/VCI for ATM bonding and the configuration of ADSL2/2+ Annex B support if ISDN support is required, on an xDSL interface.

DSL modules and ports automatically detect any existing configuration and will attempt to bring pairs into service. For PTM bonding, the underlying transport mechanism is Ethernet. For ADSL2+ ATM bonding, the underlying transport mechanism is ATM, which requires a configured VPI/VCI. The default VPI/VCI on the 7705 SAR-M is 8/35, and only a single VC can be configured.

The only mode of operation for all SHDSL and xDSL pairs on the 7705 SAR-M is bonded mode. On the 7705 SAR-Wx, the only mode for xDSL pairs is PTM bonded mode.

Log files are created to record critical events during xDSL and SHDSL chipset initialization and for any DSL-related operational events. The log file can be viewed through the CLI or the NSP NFM-P for debugging and troubleshooting. The event data can be directed to the default log file or to a specific user-configured log file.

The CLI commands to configure DSL are found under the **config>port>dsl** context.

3.2.18.6 Layer 3 Protocol Support and Service Provisioning

[Table 21](#) lists the limits for the 6-port DSL Combination module, the 8-port xDSL module, and the RJ-45 xDSL port on the 7705 SAR-Wx.

Table 21 DSL Module and Port Limits

		6-port DSL Combination module		8-port xDSL module	7705 SAR-Wx RJ-45 xDSL port
		SHDSL	xDSL		
Maximum number of bonding groups		1	1	1	1
PTM bonding group size		2 to 4 pairs	1 to 2 pairs	1 to 8 pairs	1 to 4 pairs
ATM bonding group size		—	1 to 2 pairs	1 to 2 pairs	—
MTU		2048 bytes Only validated to 1594 bytes due to ISAM	2000 bytes Only validated to 1980 bytes due to ISAM	2000 bytes Only validated to 1980 bytes due to ISAM	2000 bytes Only validated to 1980 bytes due to ISAM
Maximum downstream/ upstream user data rate	8-pair bonding	—	—	350/350 Mb/s (with a trained group rate of 800/400M US/DS)	—
	4-pair bonding	21 Mb/s (with a trained data rate of 22.784 Mb/s symmetrically)	191/100 Mb/s with 2-pair bonding	350 Mb/s DS rate	191/100 Mb/s with 2-pair bonding
	2-pair bonding	10 Mb/s (with a trained data rate of 11.392 Mb/s symmetrically)	191/100 Mb/s (with a trained line rate of 200/103 Mb/s US/DS)	191/100 Mb/s (with a trained line rate of 200/103 Mb/s US/DS)	191/100 Mb/s (with a trained line rate of 200/103 Mb/s US/DS)

3.2.19 Custom Alarms on Ethernet Ports

The 7705 SAR supports custom alarms on Ethernet ports without the need to deploy a dry-contact alarm aggregator. Custom alarms can be created and assigned to any RJ-45 port; the port must be configured for 100Base-Tx operation with autonegotiation disabled. One alarm input can be configured for each port with the following:

- name
- description
- association with a user-defined alarm

Alarm inputs must be associated with an alarm in order for them to be triggered. Alarm inputs consist of an Ethernet LOS event caused by breaking contact loops between pins 1 and 3 or 2 and 6 on the Ethernet port. Breaking either loop will trigger the port alarm, and reconnecting the loops will clear the alarm.

For information on configuring the alarm inputs, see [Configuring Auxiliary Alarm Card, Chassis, and Ethernet Port External Alarm Parameters](#).

3.3 802.1x Network Access Control

The 7705 SAR supports network access control over client devices on an Ethernet network using the IEEE 802.1x standard. 802.1x is a standard for authenticating Ethernet devices before they can access the network. In the case of the 7705 SAR, authentication is performed using Extensible Authentication Protocol (EAP) over LAN (EAPOL).

802.1x provides protection against unauthorized access by forcing the device connected to the 7705 SAR to go through an authentication phase before it is able to send any non-EAP packets. Only EAPOL frames can be exchanged between the aggregation device (called the authenticator; for example, the 7705 SAR) and the customer device (called the supplicant) until authentication is successfully completed. The 7705 SAR enables the port after successful authentication. While the port is unauthenticated, the port will be “down” to all upper layer protocols or services.

A typical use for EAPOL would involve a 7705 SAR and some type of Ethernet device, such as a laptop, a set-top box, or a Node B. An authentication server would negotiate with the Ethernet device through the 7705 SAR (whose role is authenticator). For example, a technician using a laptop to gain access to his or her network at a cell site would have his or her laptop subject to the 802.1x access control, just as the Node B would. In every case, the Ethernet device connected to the 7705 SAR must negotiate for network access. Essentially, with EAPOL in use, any Ethernet device that connects to the 7705 SAR must negotiate for permission to send traffic through the 7705 SAR Ethernet port.

The 7705 SAR supports the following EAP methods: MD5, TLS, TTLS, and PEAPv0.

MAC authentication can be used to authenticate client devices that do not support EAP. For more information, see [MAC Authentication](#).

This section describes the following:

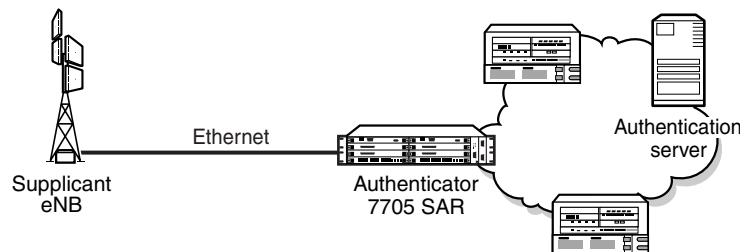
- [802.1x Basics](#)
- [802.1x Modes](#)
- [802.1x Timers](#)
- [802.1x Configuration and Limitations](#)

3.3.1 802.1x Basics

The IEEE 802.1x standard defines three participants in an authentication conversation (see [Figure 18](#)):

- the supplicant — the end-user device that requests access to the network
- the authenticator — controls access to the network. Both the supplicant and the authenticator are referred to as Port Authentication Entities (PAEs).
- the authentication server — performs the actual processing of the user information

Figure 18 802.1x Architecture



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The authentication exchange is carried out between the supplicant and the authentication server; the authenticator acts only as a bridge. The communication between the supplicant and the authenticator is done using EAPOL. The communication between the authenticator and the authentication server is done using the RADIUS protocol. The authenticator is therefore a RADIUS client, and the authentication server is a RADIUS server.

[Figure 19](#) shows an example of the messages transmitted during an authenticator-initiated One Time Password (OTP) authentication process.



Note: OTP is one of many authentication mechanisms that are available for use between the supplicant and the authentication server. These authentication mechanisms (protocols) are transparent to the 7705 SAR.

The authenticator initiates the procedure when the Ethernet port becomes operationally up by sending a special PDU called an EAP-Request/ID to the supplicant. The supplicant can also initiate the exchange by sending an EAPOL-start PDU if it does not receive the EAP-Request/ID frame during boot-up. The supplicant responds to the EAP-Request/ID with an EAP-Response/ID frame containing its identity (typically username + password).

After receiving the EAP-Response/ID frame, the authenticator encapsulates the identity information into a RADIUS Access Request packet, and sends it off to the configured RADIUS server. The RADIUS Access Request packet contains the following attributes:

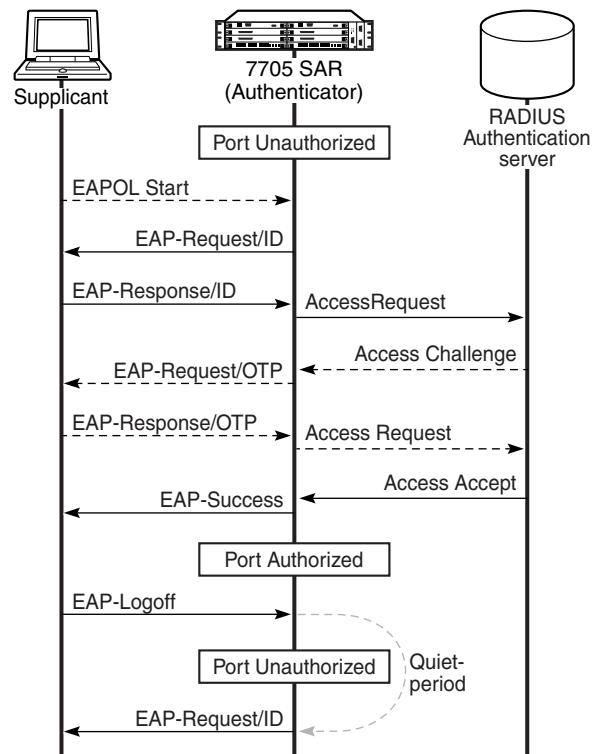
- User-Name – the name of the supplicant to be authenticated
- Calling-Station-Id – the MAC address of the supplicant
- NAS-IP-Address – the IP address of the device acting as the authenticator
- NAS-Port – the physical port number of the device acting as the authenticator
- State – allows state information to be maintained between the authenticator and the RADIUS server
- EAP-Message – used to encapsulate EAP packets for transmission from the authenticator to the RADIUS server
- Message-Authenticator – used to authenticate and protect the integrity of Access Request messages in order to prevent spoofing attacks

The RADIUS server checks the supplied credentials using an authentication algorithm to verify the supplicant's identity. If approved, the RADIUS server returns an Access Accept message to the authenticator. The authenticator notifies the supplicant with an EAP-Success message and puts the port in the authorized state.

If the supplicant sends an EAP-Logoff message, the authenticator puts the supplicant in an unauthorized state and continues searching for supplicants to authenticate.

After sending an EAP-Failure message, the authenticator puts the supplicant in an unauthorized state, waits for the number of seconds defined by the quiet-period timer, then continues searching for supplicants to authenticate.

The 7705 SAR conforms to the relevant sections of the 802.1X-2001 implementation.

Figure 19 Authentication Scenario

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3.3.2 802.1x Modes

The 7705 SAR supports port-based network access control for Ethernet ports only. Each Ethernet port can be configured to operate in one of three different modes, controlled by the **port-control** command:

- **auto** — enables 802.1x authentication. The port starts in the unauthorized state, allowing only EAPOL frames to be sent and received through the port. Both the authenticator and the host (supplicant) can initiate an authentication process as described earlier. The port will remain in the unauthorized state until the first supplicant is authenticated successfully. After this, traffic is allowed on the port for all connected hosts.
- **force-auth** — disables 802.1x authentication and causes the port to transition to the authorized state without requiring any authentication exchange. The port transmits and receives normal traffic without requiring 802.1x-based host authentication. This is the default setting.

- **force-unauth** — causes the port to remain in the unauthorized state, ignoring all attempts by the hosts to authenticate. The authenticator cannot provide authentication services to the host through the interface.

3.3.3 802.1x Timers

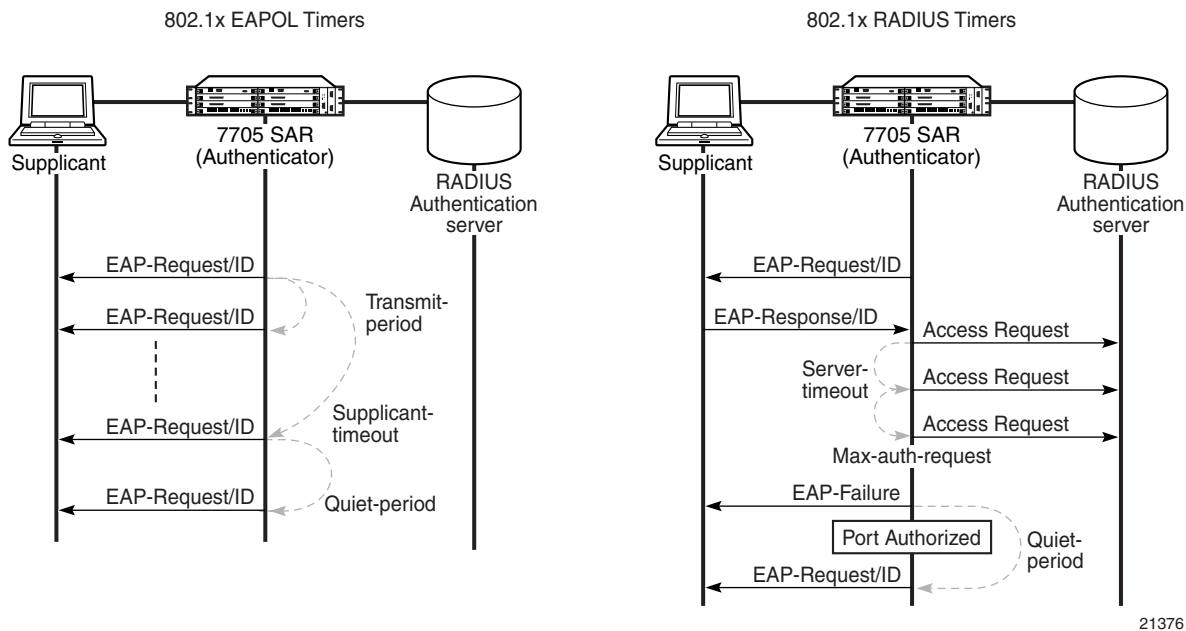
The 802.1x authentication process is controlled by a number of configurable timers. There are two separate sets, one for the EAPOL message exchange and one for the RADIUS message exchange. [Figure 20](#) shows an example of the timers.

EAPOL timers:

- **transmit-period** — indicates how many seconds after sending an EAP-Request/ID frame that the 7705 SAR will listen for a supplicant to authenticate (by sending a EAP-Response/ID frame). If the timer expires before a response is received, a new EAP-Request/ID frame will be sent and the timer restarted. The default value is 30 s. The range is 1 to 3600 s.
- **supplicant-timeout** — indicates how many seconds to allow the 7705 SAR to complete the authentication process. This timer is started at the beginning of a new authentication process (transmission of first EAP-Request/ID frame and receipt of an EAP-Response/ID frame). If the timer expires, the 802.1x authentication session is considered to have failed and the 7705 SAR waits for the quiet-period timer to expire before processing another authentication request. The default value is 30 s. The range is 1 to 300 s.
- **quiet-period** — indicates the number of seconds that the authenticator will not search for clients after an unsuccessful EAP authentication. The timer is started after sending an EAP-Failure message or after expiry of the supplicant timeout timer. The default value is 60 s. The range is 1 to 3600 s.

RADIUS timers:

- **max-auth-req** — indicates the maximum number of times that the authenticator will send an authentication request to the RADIUS server before the process is considered as to have failed. The default value is 2. The range is 1 to 10.
- **server-timeout** — indicates how many seconds the authenticator will wait for a RADIUS response message. If the timer expires, the access request message is sent again, up to the max-auth-req value, and the timer is reset. The default value is 30 s. The range is 1 to 300 s.

Figure 20 802.1x EAPOL Timers and RADIUS Timers

The authenticator can also be configured to periodically trigger the authentication process automatically. This is controlled by the `enable reauthentication` and `reauthentication period` parameters. `Re-auth-period` indicates the time in seconds (since the last time that the authorization state was confirmed) before a new authentication process is started. The range of `re-auth-period` is 1 to 9000 s (the default is 3600 s). The port stays in an authorized state during the reauthentication process.

3.3.4 802.1x Configuration and Limitations

Configuration of 802.1x network access control on the authenticator consists of two parts:

- generic parameters, which are configured under **`config>system>security>dot1x`**
Refer to the Basic System Configuration Guide, “System Command Reference”.
- port-specific parameters, which are configured under **`config>port>ethernet>dot1x`**

802.1x provides access to the port for any device, even if only a single client has been authenticated. Additionally, it can only be used to gain access to a predefined Service Access Point (SAP). It is not possible to dynamically select a service (such as a VPLS service) depending on the 802.1x authentication information.

3.4 MAC Authentication

The 7705 SAR supports the 802.1x EAP standard for authenticating Ethernet devices before they can access the network. However, if a client device does not support 802.1x EAP, MAC authentication can be used to prevent unauthorized traffic from being transmitted through the 7705 SAR.

802.1x EAP must be enabled for MAC authentication to be used, as MAC authentication is a fallback mechanism. To authenticate a port using MAC authentication, 802.1x authentication must first be configured on the 7705 SAR by enabling **port-control auto**, and then **mac-auth** must be configured on the 7705 SAR to enable MAC authentication.

When a port becomes operationally up with MAC authentication enabled, the following steps are performed by the 7705 SAR (as the authenticator):

1. After transmission of the first EAP-Request/ID PDU, the 7705 SAR starts the **mac-auth-wait** timer and begins listening on the port for EAP-Response/ID PDUs. At this point, the 7705 SAR only listens to EAPOL frames. If EAPOL frames are received, 802.1x authentication is chosen.



Note: If it is known that the attached equipment does not support EAP, **no mac-auth-wait** can be configured so that MAC authentication can be used as soon as the port is operationally up.

2. If the **mac-auth-wait** timer expires, and no EAPOL frames have been received, the 7705 SAR begins listening on the port for any Ethernet frames.
3. If the 7705 SAR receives an Ethernet frame, the 7705 SAR scans the client source MAC address in the frame and transmits the MAC address to the configured RADIUS server for comparison against the MAC addresses configured in its database.

The following attributes are contained in the RADIUS message:

- User-Name – the source MAC address of the client device
- User-Password – the source MAC address of the client device in an encrypted format
- Service-Type – the type of service that the client has requested; the value is set to 10 (call-check) for MAC authentication requests
- Calling-Station-Id – the source MAC address of the client device
- NAS-IP-Address – the IP address of the device acting as the authenticator
- NAS-Port – the physical port of the device acting as the authenticator

-
- Message-Authenticator – used to authenticate and protect the integrity of Access Request messages in order to prevent spoofing attacks
4. If the MAC address is approved by the RADIUS server, the 7705 SAR enables the port for traffic transmission.
If the MAC address is rejected by the RADIUS server, the 7705 SAR enters a quiet period, configured using the **quiet-period** command, and will not authenticate the port via either 802.1x or MAC authentication. After the quiet period expires, the 7705 SAR returns to step 1.
 5. If a port that was previously authenticated with MAC authentication receives an EAPOL-Start frame, the port will reauthenticate using 802.1x EAPOL.

While the port is unauthenticated, the port will be “down” to all upper layer protocols or services.

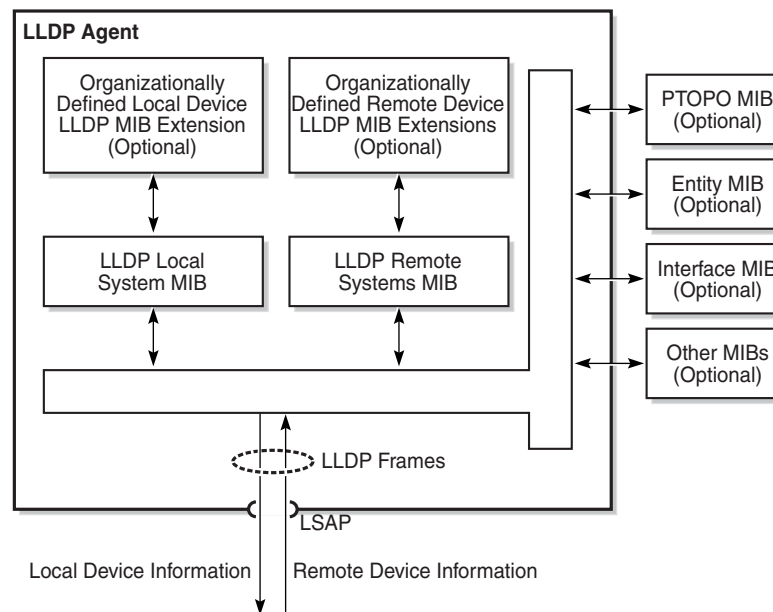
3.5 Link Layer Discovery Protocol (LLDP)

The IEEE 802.1ab Link Layer Discovery Protocol (LLDP) allows stations that are attached to the same IEEE 802 LAN (emulation) to advertise information for the purpose of populating physical or logical topology and device discovery management information databases. In other words, IEEE 802.1ab Link Layer Discovery Protocol allows an LLDP agent to learn connectivity and management information from adjacent stations. The information obtained via this protocol is stored in standard MIBs which can be accessed via management protocols such as SNMP.

LAN emulation and logical topology is applicable to customer bridge scenarios (enterprise or carrier of carrier) connected to a provider network offering a transparent LAN emulation service to their customers. LAN emulation helps customers detect intermediate provider misconnections by offering a view of the customer topology where the provider service is represented as a LAN interconnecting customer bridges.

The IEEE 802.1ab standard defines a protocol that:

- advertises connectivity and management information about the local station to adjacent stations on the same IEEE 802 LAN
- receives network management information from adjacent stations on the same IEEE 802 LAN
- operates with all IEEE 802 access protocols and network media
- establishes a network management information schema and object definitions that are suitable for storing connection information about adjacent stations
- provides compatibility with a number of MIBs as shown in [Figure 21](#)

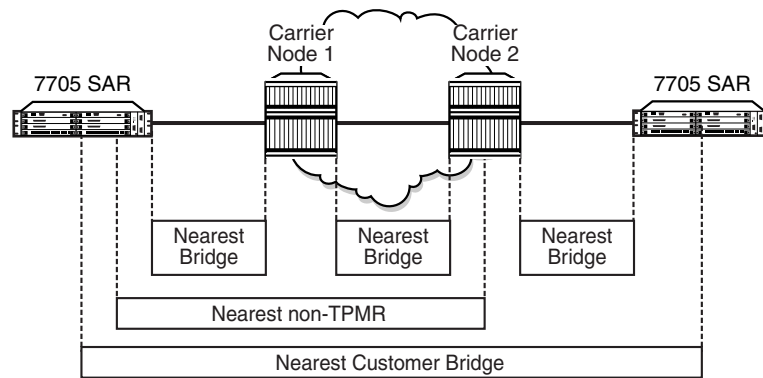
Figure 21 LLDP Internal Architecture for a Network Node

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Network operators must be able to discover the topology information in order to detect and address network problems and inconsistencies in the configuration. Standards-based tools can address complex network scenarios where multiple devices from different vendors are interconnected using Ethernet interfaces.

The 7705 SAR platforms, cards, and modules support LLDP on all Ethernet datapath ports. On the 2-port 10GigE (Ethernet) Adapter card/module, LLDP is supported on the Ethernet ports, but not on the v-port. Each Ethernet port can be configured to run up to three LLDP sessions. Each session can have up to five peers and each peer can store up to three management addresses. The 7705 SAR can have a maximum of 720 peers configured.

[Figure 22](#) shows the three scopes of LLDP that are supported on the 7705 SAR. The scopes are Nearest Bridge, Nearest non-TPMR Bridge, and Nearest Customer Bridge.

Figure 22 Network Example For LLDP

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3.5.1 LLDP Protocol Features

LLDP allows stations attached to an IEEE 802 LAN to advertise to other stations attached to the same LAN, the major capabilities provided by the system incorporating that station, the management address or addresses of the entity or entities that manage these capabilities, and the identification of the station's point of attachment to the LAN required by the management entity or entities.

The information distributed via this protocol is stored on the receiving device in a standard MIB, so that the information can be accessed by a Network Management System (NMS).

The LLDP protocol uses an LLDP agent entity that implements LLDP for a particular MAC service access point (MSAP) associated with a port.

LLDP does not contain a mechanism for soliciting specific information from other LLDP agents, nor does it provide a specific means of confirming the receipt of information. LLDP allows the transmitter and the receiver to be enabled separately; therefore, the local LLDP agent can be configured to transmit only, receive only, or both transmit and receive LLDP information.

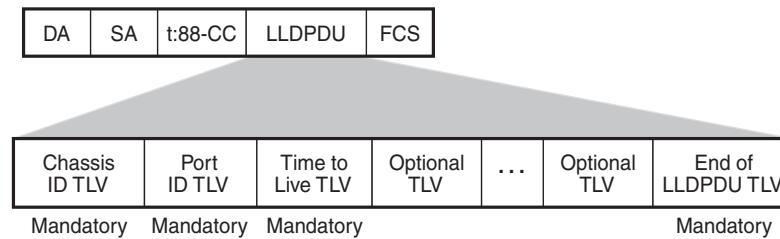
LLDP agents transmit and receive LLDP Data Units (LLDPDUs). The LLDPDU contains an LLDP frame whose information fields are a sequence of variable-length information elements. Each element includes type, length, and value fields (known as TLVs).

- Type identifies what kind of information is being sent.
- Length indicates the length of the information string in octets.

- Value is the actual information that needs to be sent; for example, a binary bit map or an alphanumeric string that can contain one or more fields.

Each LLDPDU contains four mandatory TLVs and can contain optional TLVs as selected by network management. [Figure 23](#) shows the LLDPDU format.

Figure 23 LLDPDU Format



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The chassis ID TLV identifies the chassis containing the Ethernet port responsible for transmitting the LLDPDU. The port ID TLV identifies the Ethernet port responsible for transmitting the LLDPDU. The chassis ID and the port ID values are concatenated to form a logical identifier (the MSAP identifier) that is used by the recipient to identify the sending LLDP agent and associated port. Both the chassis ID and port ID values can be defined in a number of ways. Once selected, however, the chassis ID and port ID value combination remains the same as long as the particular port remains operable.

The Time To Live TLV indicates the number of seconds (from 0 to 65535) that the receiving LLDP agent should consider the information contained in the received LLDPDU to be valid. The Time To Live TLV is calculated by the formula **tx-interval** × **tx-hold-multiplier**. The associated information is automatically discarded by the receiving LLDP agent if the sender fails to update it before this time. A zero value indicates that any information pertaining to this LLDPDU identifier is to be discarded immediately. A TTL value of zero can be used, for example, to signal that the sending port has initiated a port shutdown procedure.

The End of LLDPDU TLV marks the end of the LLDPDU.

3.6 Surveillance, Control, and Data Acquisition (SCADA) Support

SCADA systems are used in many strategic industry networks, such as utility and transportation, to monitor and maintain the networks from remote monitoring locations. SCADA systems use a master/slave architecture with a single master that supports multiple slave remote terminal units (RTUs).

Nokia addresses the needs of SCADA customers with the Integrated Services card. The Integrated Services card is a resource card that is capable of supporting software applications that specifically meet the requirements of TDM-based SCADA systems. The card is supported on the 7705 SAR-8 and the 7705 SAR-18.

The Integrated Services card supports the following SCADA applications:

- multidrop data bridge (MDDB)
- pulse code modulation (PCM) multidrop bridge
- voice conference bridge (VCB)

Only one application can be active on the card at a time.

The MDDB and PCM multidrop bridge applications feature similar architecture and functionality, with the main exception being that the MDDB application uses a serial RS-232 or X.21 interface, while the PCM multidrop bridge application uses an E&M analog interface. The VCB application builds on the PCM architecture, using A-Law or Mu-Law encoding and an E&M analog interface.

3.6.1 Multidrop Data Bridge

The MDDB application provides a centralized digital bridging functionality that allows a SCADA bridge to be configured between a master and remote slaves. The bridge allows a single data message stream to be broadcast from a master to multiple slaves and allows a single slave to communicate back to the master.

In a SCADA network, the 7705 SAR provides the communications infrastructure to connect the central masters to multiple RTUs at remote locations, where the masters and RTUs communicate over serial RS-232 or X.21 links (synchronous or asynchronous). The 7705 SAR-8 or 7705 SAR-18 located at the master site contains the Integrated Services card, which provides the MDDB bridge functionality and acts as the MDDB master. Remote 7705 SAR nodes connected to RTUs are referred to as MDDB slaves.

For both master and slave applications, the 7705 SAR must be physically connected to the SCADA device by one of the following:

- a 7705 SAR-8 or 7705 SAR-18 using the 12-port Serial Data Interface card (supports both RS-232 and X.21 links)
- a 7705 SAR-H using the 4-port T1/E1 and RS-232 Combination module (supports RS-232 links only)
- a 7705 SAR-Hc using an on-board RS-232 serial port (supports RS-232 links only)

The 12-port Serial Data Interface card also supports an RS-530/RS-422 interface with the use of an adapter cable that connects to a DB15 connector on the front of the X.21 distribution panel. There is no configuration specifically for the RS-530/RS-422 interface; configuration is done in X.21 mode and applies to the RS-530/RS-422 interface when it is physically enabled through hardware. For information about 12-port Serial Data Interface card adapter cables, see the 7705 SAR Serial Data Interface Card Installation Guide.

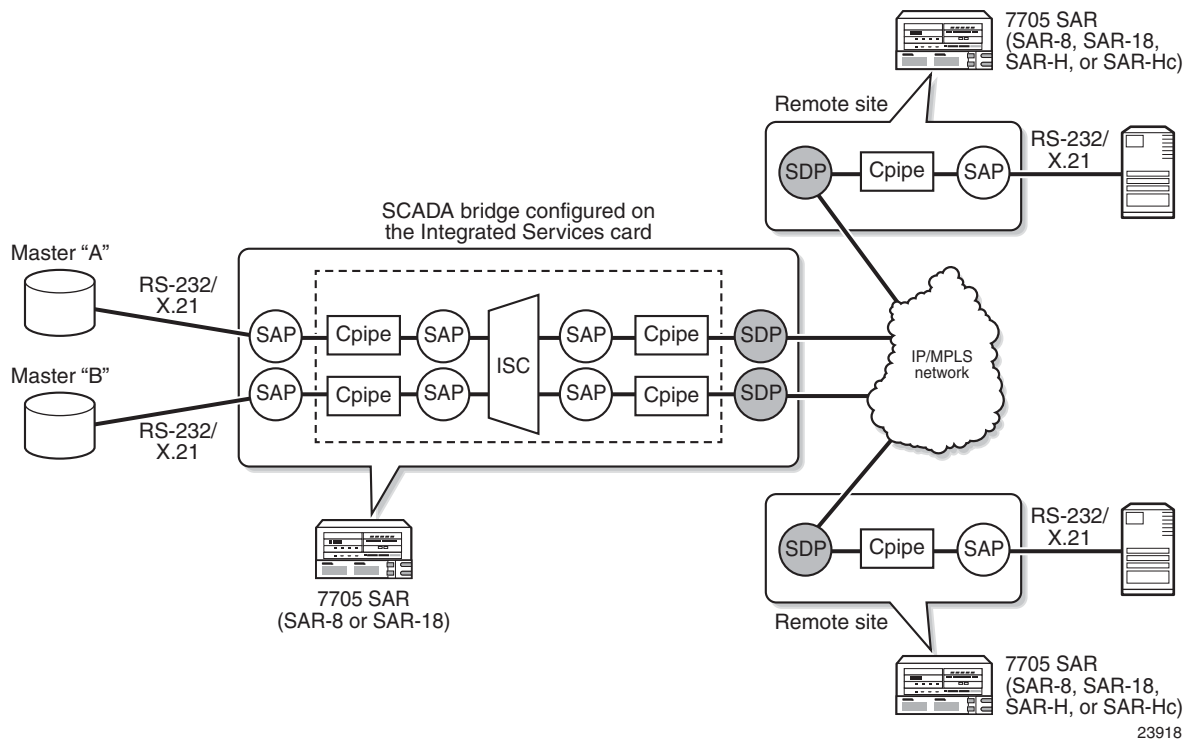
The remote nodes are connected to the SCADA bridge over an IP/MPLS network.

An Integrated Services card supports up to 16 SCADA bridges. Each bridge supports 32 branches. Two branches (branch 1 and branch 2) are dedicated connections to the SCADA masters; the other 30 branches connect to the slaves. An MDDDB SCADA bridge is created using the **config>scada bridge-id** command and a branch is created using the **config>scada>branch branch-id** command.



Note: Larger bridges can be built by cascading individual bridges internally within a single Integrated Services card and using the master output from one bridge as the slave input to another bridge. Larger bridges can be cascaded across multiple Integrated Services cards by using an RS-232 link or an X.21 link.

[Figure 24](#) shows a typical SCADA MDDDB network. A Cpipe SAP is configured for each master and slave branch in order to transmit data to the bridge. The RS-232/X.21 traffic is converted to a 64 kb/s Cpipe using high capacity multiplexing (HCM). The Integrated Services card terminates the Cpipe (the slaves send data back over the IP/MPLS network), recovers the data directly from the Cpipe as an HCM frame, and sends the data to the bridge.

Figure 24 SCADA MDDB Network

3.6.2 PCM Multidrop Bridge

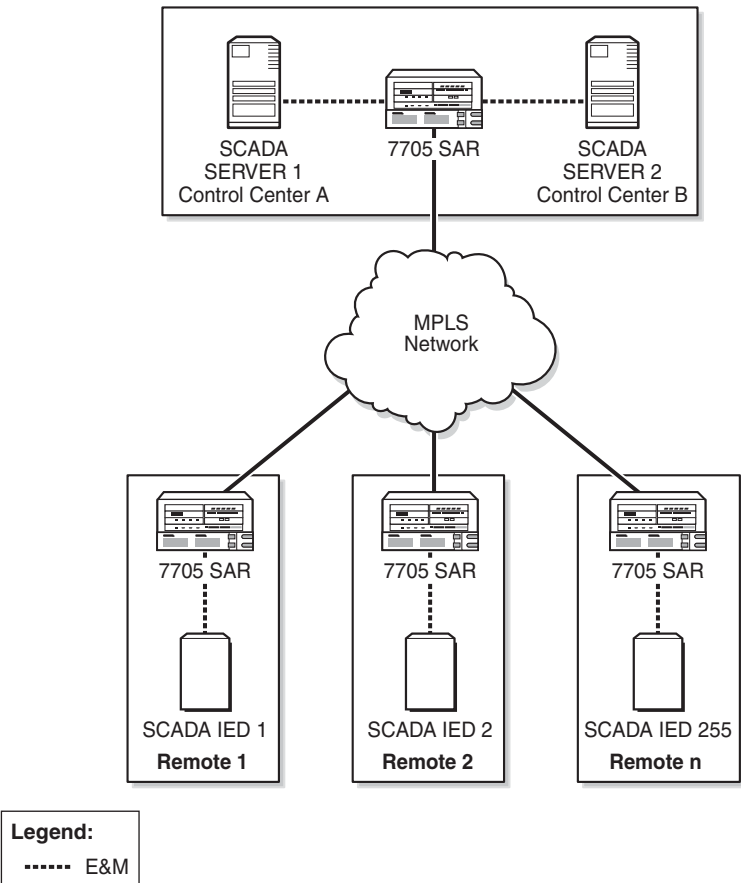
The pulse code modulation (PCM) multidrop bridge application provides multidrop bridging for SCADA systems that use 4-wire analog modems to connect remote slaves to a master. Incoming analog signals from the master are converted to PCM (Mu-Law or A-Law) for transport between a remote slave and the master. The Integrated Services card broadcasts the master stream to all remote slaves. Only the addressed remote unit will respond to the broadcast and the response must be transported through the bridge back to the master via an E&M interface. If the network RTUs support two SCADA systems over the same interface by separating them into high-frequency and low-frequency bands, the PCM multidrop bridge always selects the two loudest branches to be passed through the bridge for communication with the master.

Note: E&M signaling transport through the bridge is not supported.



Figure 25 shows a typical SCADA PCM multidrop bridge network.

Figure 25 SCADA PCM Multidrop Bridge Network



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The PCM multidrop bridge application uses Mu-Law and A-Law encoding; therefore, the modularity is different from MDDDB modularity. Table 22 shows the modularity for a PCM multidrop bridge on the Integrated Services card.

Table 22 PCM Multidrop Bridge Modularity

Encoding Scheme	Number of Bridges per Integrated Services Card	Number of Branches per Bridge	Total Number of Branches per Integrated Services Card
Mu-Law (North America)	16	22	352
A-Law (rest of world)	16	30	480

A PCM SCADA bridge is created using the **config>scada bridge-id** command and a branch is created using the **config>scada>branch branch-id** command.



Note: Larger bridges can be built by cascading individual bridges internally within a single Integrated Services card and using the master output from one bridge as the slave input to another bridge. Larger bridges can be cascaded across multiple Integrated Services cards by using an E&M link.

3.6.3 Redundant Masters

The MDDB and PCM multidrop bridge applications support redundant masters, where both masters listen to all traffic that is being transmitted from the slaves but only the active master broadcasts data to the slaves.

There are two modes for master redundancy:

- manual (default mode)

In manual mode, if a master branch fails, the second master branch must be made active manually with the **force-active** command in order to receive data from the master input. The bridge always broadcasts to both master branches.

- auto

In auto mode, both master branch inputs are received simultaneously. This requires the master input behavior to be similar to an RTU; that is, only the active master transmits data and the standby master transmits either all 1s (MDDB) or no data (PCM). If the bridge is in auto mode, the **force-active** command cannot be used.

3.6.4 Squelch Functionality

A condition may occur where a single slave continues to send data to the master after the normal response period has expired. This condition locks up the bridge so that no other slave can transmit data back to the master. To resolve this condition, the **squelch** command can be enabled on a bridge or on an individual slave or master branch. Squelch is enabled by configuring a timeout period that, once expired, raises an alarm and triggers the squelching function. A normal quiescent traffic pattern (all 1s for MDDB and low volume for PCM multidrop) is inserted towards the bridge. This blocks the problematic slave so that other slaves can continue to use the bridge.

In order to put the bridge into the normal state, it must be reset. This can be manually initiated by the operator with the **squelch reset** command, or it can occur automatically after a configured time if the **squelch-recovery** command is set to **auto**.

For MDDB, because different algorithms are needed to detect squelch conditions at low-speed and high-speed rates, interface speed selection is required. The interface speed is set at the bridge level.

3.6.5 Voice Conference Bridge

The voice conference bridge (VCB) application provides a simultaneous communication path between two or more voice circuits. VCBs are deployed in a central location with remote devices connected to the bridge via the 7705 SAR over an IP/MPLS or TDM network. Inputs to the VCB are 4-wire E&M analog interfaces.

VCBs can be used as a conference bridge with any-to-any connectivity (all branches participate) or as a bridge in broadcast mode where one branch broadcasts to the other branches that are in listen-only mode.

The main VCB applications are:

- Land Mobile Radio (LMR) interconnection
Both voice conference mode and broadcast mode can be used for this application.
- analog multi-terminal teleprotection interconnect for electrical utilities
For multi-terminal teleprotection applications, VCBs allow all teleprotection relays to communicate with each other in order to make the appropriate switching decision in the event of a fault.

The VCB application uses Mu-Law and A-Law encoding, similar to PCM. [Table 23](#) shows the modularity for a VCB on the Integrated Services card.

Table 23 VCB Modularity

Encoding Scheme	Number of Bridges per Integrated Services Card	Number of Branches per Bridge	Total Number of Branches per Integrated Services Card
Mu-Law (North America)	16	24	384
A-Law (rest of world)	16	32	512

A VCB SCADA bridge is created using the **config>scada bridge-id** command and a branch is created using the **config>scada>branch branch-id** command.



Note: Larger bridges can be built by cascading individual bridges internally within a single Integrated Services card. Larger bridges can be cascaded across multiple Integrated Services cards by using an E&M link or a channel group encapsulated for **cem** (TDM).

3.6.5.1 VCB Applications

VCB can be configured in one of four applications. These applications are set at the card level. Each application uses a bridging algorithm that determines which branches control the management of the bridge and transmission of signals:

- VCB
One branch talks and all other branches on the bridge can hear.
- broadcast
Only one branch on the bridge (fixed as branch 1) has control of the bridge to transmit, and all other branches are in listen-only mode.
- VCB branch initiate
Branches on the bridge are only enabled (unmuted) when the attached base station signals its presence by grounding the M-lead on the interface connected to the bridge. Upon receiving the grounded M-lead via T1/E1 ABCD bits or TDM PW signaling, the bridge unmutes the associated branch. When the ground is removed, the branch is muted again.
- teleprotection
Each teleprotection relay transmits state information on discrete frequencies so that each relay can both hear what the other relays are transmitting as well as transmit its own information to the other relays.

3.6.5.2 Gain

Gain is the increase or decrease in signal power or voltage that occurs in transmitting a signal from one point to another. The two types of gain are:

- input
- output

Gain is configured at the branch level.

The input gain defines the magnitude of the increase or decrease of the signal transmitted into the bridge. The input gain range is –16 to +9 dB in 1-dB increments (the default is 0 dB).

The output gain defines the magnitude of the increase or decrease of the signal received from the bridge. The output gain range is –16 to +9 dB in 1-dB increments (the default is 0 dB).

3.6.6 Serial Transport Over Raw Sockets

Serial transport over raw sockets provides the capability of transporting serial data, in the form of characters, over an IP transport service within a Layer 3 IP/MPLS service (IES or VPRN). A raw socket allows direct sending and receiving of IP packets without any protocol-specific transport layer formatting. For information about raw socket IP transport services, refer to the 7705 SAR Services Guide, Service Overview chapter, “Raw Socket IP Transport Service”.

The feature provides the functionality for a local host to listen to and open raw socket sessions from remote hosts, and for a remote host to initiate and open raw socket sessions to local hosts. The local and remote host functions support TCP or UDP sessions (but not both concurrently) over the IP transport service.

Raw sockets are supported on the following hardware:

- RS-232 ports on the 12-port Serial Data Interface card, version 2
- RS-232 ports on the 7705 SAR-Hc
- RS-232 ports on the 4-port T1/E1 and RS-232 Combination module



Note:

- RS-232 serial data can be carried over Cpipes or over raw sockets using IP transport. To use Cpipes, the RS-232 port must be configured with a channel ID. To use raw sockets, the RS-232 port must be configured with a socket ID.
- The 12-port Serial Data Interface card, version 2, supports a mix of Cpipes and raw socket serial links on the same card.

Figure 26 shows an example of a raw socket application, where serial data is transferred between RTUs and a utility’s SCADA management system using an IP transport service across a Layer 3 service (IES or VPRN), that includes 7705 SAR-H/Hc and 7705 SAR-8/18 nodes.

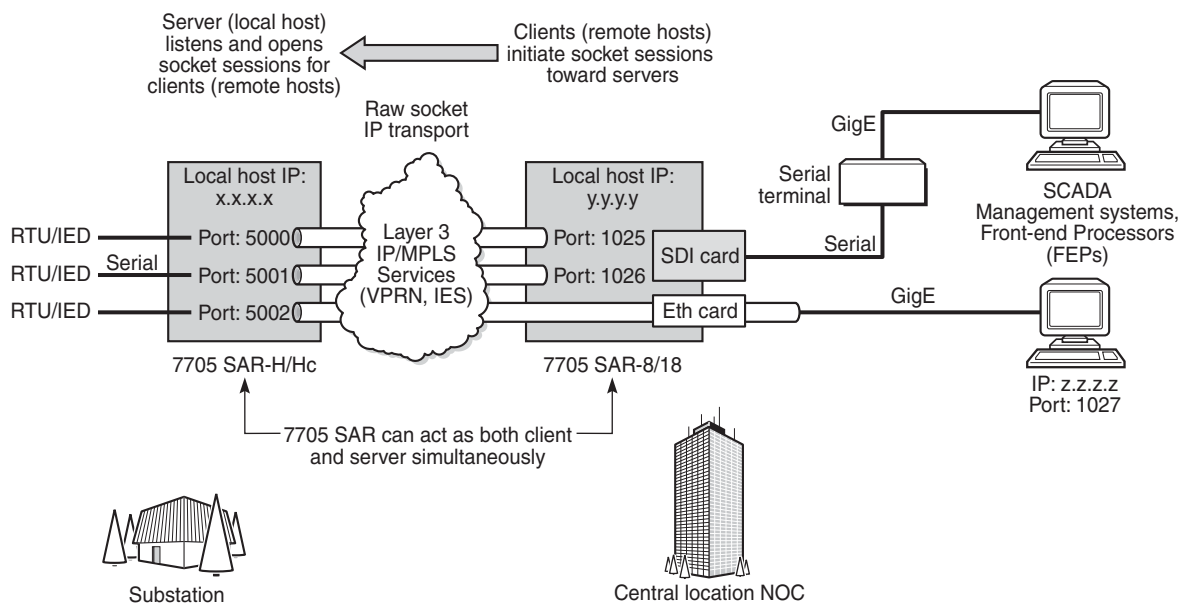
A raw socket local host (acting as a server) at the 7705 SAR-H/Hc substation listens to TCP sessions that originate at the 7705 SAR-8/18 central location network operations center (NOC). The 7705 SAR-8/18 at the NOC is connected to two front-end processors (FEPs), one via a serial port and another via an Ethernet port. The serial port on the 7705 SAR-8/18 is configured as a remote host (acting as a client) that initiates TCP/UDP sessions towards the RTU at the 7705 SAR-H/Hc substation when traffic is received from the FEP over the serial port. These TCP/UDP sessions are transported over the IP/MPLS network using IP transport service over an IES or VPRN service. The serial data that is transported over the TCP/UDP session and received at the 7705 SAR-H/Hc is then sent over the serial link towards the RTU. TCP/UDP sessions received from the FEP over the Ethernet port are transported over an IES or VPRN service (that is, there is no need for serial remote host configuration in this case).

Multiple FEPs can poll a single RTU. If multiple sessions attempt to transmit serial data on the serial port simultaneously, the 7705 SAR queues packets per session and ensures that all data for one session is sent out before processing another session's data, ensuring that sessions do not overlap one another.



Note: A serial port can be concurrently configured as both a server (local host) and a client (remote host). This is accomplished with the **local-host** command configuration to support the server function and the **remote-host** command configuration to set up client sessions to far-end remote hosts.

Figure 26 Serial Transport Over Raw Socket Application



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3.6.6.1 Raw Socket Configuration

A raw socket IP transport interface can be configured for each RS-232 serial port on a node. This allows the serial port to receive TCP connections or UDP session packets from multiple remote hosts, or to create new sessions to remote hosts in order to send and receive serial data to and from those remote hosts.

There are port-level and service-level configuration requirements for a raw socket serial port to send and receive serial data in either server mode, client mode, or both.

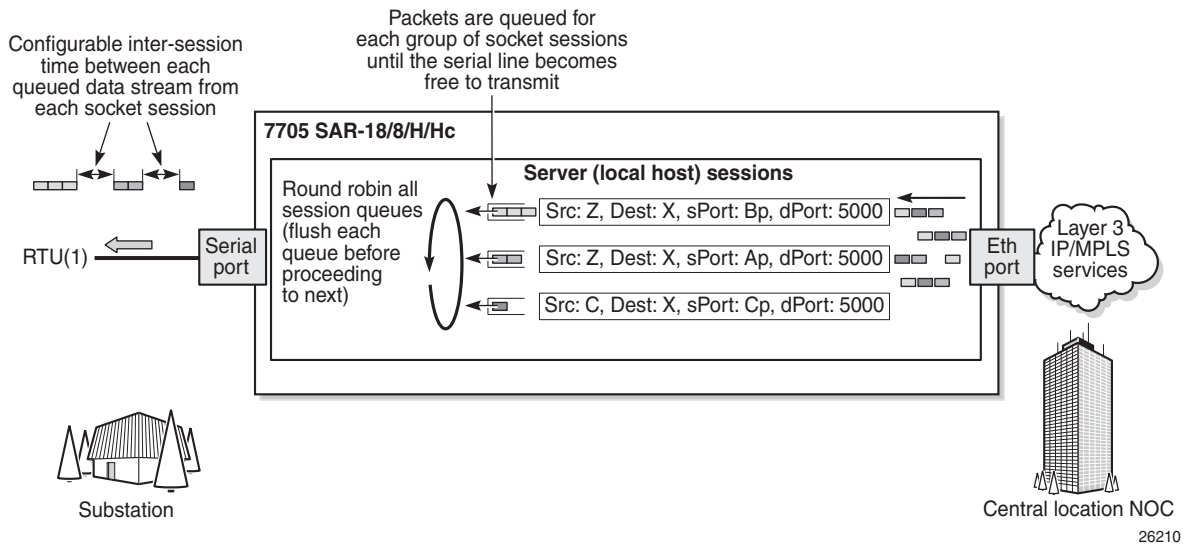
Raw socket port-level configuration includes defining the end-of-packet checking parameters (idle-time, length, special character) and the inter-session delay for transmitting session data over the serial link. See [Serial Commands](#) for the required information.

At the service level, an IP transport subservice is created within an IES or VPRN service to associate the serial port with the respective IES or VPRN service. TCP/UDP encapsulated serial data is routed within the corresponding Layer 3 IES or VPRN service. The required configuration includes IP transport subservice local-host and remote-host configuration, TCP timers, and session control. Refer to the 7705 SAR Services Guide, “IES Raw Socket IP Transport Configuration Commands” and “VPRN Raw Socket IP Transport Configuration Commands” for the required information.

3.6.6.2 Raw Socket Packet Processing

[Figure 27](#) illustrates how raw socket packets are processed over a serial link.

Session data attempting to access the serial port is queued. One queue is maintained per session. The purpose of the session queue is to prevent two different flows of packets from interleaving out the serial port and creating unreadable messages. When data is being transmitted over the serial link for a session, any other session's data is queued until the first session has emptied its queue. The next session's data is transmitted over the serial link only after the **inter-session-delay** timer expires. Each session's data is sent out in round-robin fashion.

Figure 27 Raw Socket Packet Processing

3.6.6.2.1 Raw Socket Processing for UDP Sessions

When the local host receives a UDP packet from a remote host, it queues the packet and sends it over the serial link. The local host remembers the UDP session while there is still data to send from the serial link. If further packets are received for the same session, they are queued behind the already queued packet. After all the queued data has been sent over the serial link, the session is removed from the system. An associated UDP remote host for the serial link must be configured to have serial data sent back to the remote host from the serial port.

When a packet is received from the serial link based on end-of-packet (EOP) requirements, the data is copied and sent in a UDP packet to each configured remote host.

3.6.6.2.2 Raw Socket Processing for TCP Sessions

An open TCP session from a remote host to a raw socket's local host is kept open until either the remote host terminates the session or the TCP inactivity timer expires. When a TCP session is open, all packets received from the remote host are queued for the raw socket serial link and sent over the serial link until no packets remain in the queue.

If multiple sessions are open towards the local host, and each is receiving data, each session's data is queued and then sent over the serial link in round-robin fashion for each session until no packets remain. When a packet is received over the serial link, it is copied to each open TCP session and transmitted to the remote host.

3.6.6.3 Raw Socket Squelch Functionality

A condition may occur where the end device connected to the serial port continues to send out a continuous stream of data after the normal response period has expired. This can prevent the far-end remote host or master equipment from receiving data from other end devices in the network. To resolve this condition, the **squelch** command can be used on the raw socket at the port level (it is disabled by default). This stops the socket from receiving any more data from the problematic device.

If the command is enabled, the 7705 SAR will monitor the serial port for a constant character stream. A configurable squelch delay period, using the **squelch-delay** command, is used to determine how long to measure the constant character stream before initiating the squelch function. If the squelch function is initiated, the port is considered locked up and an alarm is raised indicating the lock-up and that the squelching function has been triggered.

The serial port can be forced out of squelch and put back to normal, either manually using the **squelch-reset** command or automatically using the **unsquelch-delay** command. The **unsquelch-delay** command defines the time to wait after squelch is initiated before it is removed.

3.7 Configuration Notes

The following information describes provisioning guidelines and caveats.

- The IOM can only be designated slot 1 of the chassis.
- An IOM must be preprovisioned to accept specific adapter card types; the card type is always iom-sar.
If an adapter card type is installed in a slot provisioned for a different type, the card will not initialize.
- An adapter card installed in an unprovisioned slot remains administratively and operationally down until the IOM software is activated and the MDA slot and type is specified.
- Ports cannot be provisioned until the IOM software is activated and the MDA type is specified.

3.7.1 Reference Sources

For information on supported IETF drafts and standards as well as standard and proprietary MIBs, refer to [Standards and Protocol Support](#).

3.8 Configuring Physical Components with CLI

This section provides information to configure cards, adapter cards, and ports.

Topics in this section include:

- [Preprovisioning Guidelines](#)
- [Basic Configuration](#)
- [Common Configuration Tasks](#)
- [Service Management Tasks](#)

3.9 Preprovisioning Guidelines

The 7705 SAR platforms each have two ports on the chassis to connect terminals for management access: a console port for a terminal connection and a management port for a Telnet connection.

The console port is used to configure parameters locally through a direct connection from a system console. The management port is used to configure parameters remotely through a connection to a remote workstation, using Telnet or SSH to open a secure shell connection.

For more information about management connections, refer to the appropriate chassis installation guide, in the section on router management connections.

3.9.1 Predefining Entities

In order to initialize an adapter card, the IOM type and adapter card type must match the preprovisioned parameters. In this context, preprovisioning means to configure the entity type (IOM type, adapter card type, port, and interface) that is planned for an adapter card. Preprovisioned entities can be installed but not enabled, or the slots can be configured but remain empty until populated. Provisioning means that the preprovisioned entity is installed and enabled.

You can preprovision ports and interfaces after the IOM is activated (card slot and card type are designated) and adapter card types are specified.

3.9.2 Preprovisioning a Port or SCADA Bridge

Before a port or SCADA bridge can be configured, the adapter card slot must be preprovisioned with an allowed adapter card type (for a SCADA bridge, the only type allowed is **isc**, for the Integrated Services card).

Preprovisioning recommendations (for ports only) include:

- Ethernet
 - Configure an access port for customer-facing traffic on which services are configured.
 - Configure a network port for uplink traffic.

An encapsulation type must be specified in order to distinguish services on the access port. Encapsulation types must also be specified for network ports. By default, the encapsulation type for Ethernet ports in network mode is null.

- Channelized

- Channelized ports can be configured on the 16-port T1/E1 ASAP Adapter card, 32-port T1/E1 ASAP Adapter card, 2-port OC3/STM1 Channelized Adapter card, 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card, 8-port Voice & Teleprotection card (access mode only), 8-port FXO Adapter card (access mode only), 6-port FXS Adapter card (access mode only), 4-port DS3/E3 Adapter card (DS3 ports only), 12-port Serial Data Interface card (access mode only), 6-port E&M Adapter card (access mode only) and 4-port T1/E1 and RS-232 Combination module.
- Configure an access port for customer-facing traffic on which services are configured.
- Configure a network port for uplink traffic.

An encapsulation type must be specified in order to distinguish services on the access port or channel. For network mode, the encapsulation type is set to ppp-auto and cannot be changed.

3.9.3 Maximizing Bandwidth Use

After ports are preprovisioned, multilink bundles (MLPPP) or IMA groups can be configured to increase the bandwidth available between two nodes.

The following cards, modules, and platforms support multilink bundles:

- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- 2-port OC3/STM1 Channelized Adapter card
- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card
- T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module (on 7705 SAR-H)
- T1/E1 ports on the 7705 SAR-A (variants with T1/E1 ports)
- T1/E1 ports on the 7705 SAR-M (variants with T1/E1 ports)
- T1/E1 ports on the 7705 SAR-X

The following cards, modules, and platforms support IMA groups:

- 2-port OC3/STM1 Channelized Adapter card

- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- T1/E1 ports on the 7705 SAR-M (variants with T1/E1 ports)

All physical links or channels in a bundle or group combine to form one logical connection. A bundle or group also provides redundancy in case one or more links that participate in the bundle fail. For command syntax, see [Configuring Multilink PPP Bundles](#). To configure channelized ports for TDM, see [Configuring Channelized Ports](#).

For 12-port Serial Data Interface cards and the RS-232 ports on the 4-port T1/E1 and RS-232 Combination module, some or all of a port bandwidth can be dedicated to a channel by aggregating a number of DS0s into a single bundle. Serial data transmission rates below the rate of a single DS0, that is, less than 64 kb/s, are achieved using the High Capacity Multiplexing (HCM) proprietary protocol. These rates are known as subrates, and are supported only when operating in RS-232 mode or X.21 mode.



Note: A DS0 channel operating at a rate less than 64 kb/s still uses a full 64 kb/s timeslot.

3.9.4 Using Partial Bandwidth

Fractional T1/E1 allows one or more DS0 channels to be bundled together (up to the maximum bandwidth of the network link), allowing the customer to use only that portion of the link that is needed. This means that the PPP service can use a selected number of timeslots (octets) in the network T1 or E1 link, thus reducing the amount of T1 or E1 bandwidth that must be leased or purchased from the attached carrier. This leads to multiplexing efficiencies in the transport network.

The following cards and platforms support fractional T1/E1 on a PPP channel group (encapsulation type ppp-auto), or all timeslots on T1/E1 ports, in network mode:

- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module (on 7705 SAR-H)
- T1/E1 ports on the 7705 SAR-A (variants with T1/E1 ports)
- T1/E1 ports on the 7705 SAR-M (variants with T1/E1 ports)
- T1/E1 ports on the 7705 SAR-X

Only one channel group can be configured per port. When the channel group is configured for ppp-auto encapsulation and network mode, all timeslots (channels) are automatically allocated to the channel group. The user can then configure the number of timeslots needed. Timeslots not selected cannot be used.

3.10 Basic Configuration

The basic 7705 SAR interface configuration must include the following tasks:

- identify chassis slot (step in activating the IOM)
- specify card type (step in activating the IOM)
- identify adapter card (MDA) slot
- specify adapter card type (**mda-type**) (must be an allowed adapter card type)
- specify adapter card mode (**mda-mode**) (supported on the 4-port DS3/E3 Adapter card, the 16-port T1/E1 ASAP Adapter card version 2, the 32-port T1/E1 ASAP Adapter card, the 10-port 1GigE/1-port 10GigE X-Adapter card, the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card, and the Integrated Services card)
- identify specific port to configure

The following example displays some card and port configurations on the 7705 SAR-8.



Note: The 7705 SAR-18 displays similar output with the exception being that the MDA number goes from 1 to 12 and from X1 to X4 (for XMDA cards).

```
ALU-1>config# card 1
ALU-1>config>card# info
#-----
echo "Card Configuration"
#-----
card 1
  card-type iom-sar
  mda 1
    mda-type a6-em
  exit
  mda 2
    mda-type a4-oc3
  exit
  mda 3
    mda-type a16-chds1
  exit
  mda 4
    mda-type a4-chds3
    mda-mode cem-atm-ppp
  exit
  mda 5
    mda-type a8-eth
  exit
  mda 6
    mda-type a2-choc3
  exit
exit
```

```

#-----
echo "Port Configuration"
#-----
    port 1/1/1
        description "E&M"
        voice
            em
                no loopback
                signaling-mode em
                signaling-lead
                    m end-to-end
                    e end-to-end
            exit
            fault-signaling idle
            idle-code 13
            seized-code 5
            channel-group 1
                description "DS0GRP"
                mode access
                encap-type cem
                no shutdown
            exit
            no shutdown
        exit
        audio-wires four-wires
        tlp-rx 0.0
        tlp-tx 0.0
    exit
    no shutdown
port 1/1/2
    shutdown
    voice
    exit
.....
port 1/1/6
    shutdown
    voice
    exit
exit
.....
port 1/2/2
    shutdown
    sonet-sdh
    exit
exit
port 1/2/3
    shutdown
    sonet-sdh
    exit
exit
port 1/2/4
    shutdown
    sonet-sdh
    exit
exit
port 1/3/1
    shutdown
    tdm
    e1

```

```

        shutdown
        channel-group 1
        shutdown
        encap-type cem
        timeslots 2-10
    exit
exit
exit
exit
port 1/3/2
    shutdown
    tdm
    e1
        shutdown
        channel-group 1
        shutdown
        encap-type cem
        timeslots 2-10
    exit
exit
exit
exit
port 1/3/3
    shutdown
    tdm
    exit
exit
.....
port 1/3/15
    shutdown
    tdm
    exit
exit
port 1/3/16
    shutdown
    tdm
    e1
        shutdown
        channel-group 1
        shutdown
        description "network_port"
        mode network
    exit
exit
exit
exit
port 1/4/1
    shutdown
    tdm
    ds3
        shutdown
        encap-type atm
        framing m23
        loopback line
        atm
    exit
exit
exit
exit

```



```
    port 1/4/2
      shutdown
      tdm
      exit
    exit
  port 1/4/3
    shutdown
    tdm
    exit
  exit
  port 1/4/4
    shutdown
    tdm
    exit
  exit
  port 1/5/1
    shutdown
    ethernet
    exit
  exit
  port 1/5/2
    shutdown
    ethernet
    exit
  exit
  ....
  port 1/5/7
    shutdown
    ethernet
    exit
  exit
  port 1/5/8
    shutdown
    ethernet
    exit
  exit
  port 1/6/1
    shutdown
    sonet-sdh
    exit
    tdm
    exit
  exit
  port 1/6/2
    shutdown
    sonet-sdh
    exit
    tdm
    exit
  exit
#-----
```

3.11 Common Configuration Tasks

The following basic system tasks are performed, as required:

- [Configuring Cards and Adapter Cards](#)
- [Configuring Ports](#)
- [Configuring SCADA Bridge Parameters](#)

3.11.1 Configuring Cards and Adapter Cards

This section contains the following topics:

- [Configuring Cards](#)
- [Configuring Adapter Card Network Queue QoS Policies](#)
- [Configuring Ring Adapter Card or Module Network and Network Queue QoS Policies](#)
- [Configuring Adapter Card Fabric Statistics](#)
- [Configuring Adapter Card Fabric Profile](#)
- [Configuring Adapter Card Clock Mode](#)
- [Configuring Adapter Card Voice Attributes](#)
- [Configuring Ring Adapter Card or Module Parameters](#)
- [Configuring Auxiliary Alarm Card, Chassis, and Ethernet Port External Alarm Parameters](#)
- [Displaying Adapter Card Information](#)

3.11.1.1 Configuring Cards

Card configurations must include a chassis slot designation. A slot must be preconfigured with the type of card and adapter cards that are allowed to be provisioned.

The **mda-mode** command is used on the following adapter cards to configure the appropriate encapsulation methods (**cem-atm-ppp** or **cem-fr-hdlc-ppp**) that are required to support pseudowire services:

- 4-port DS3/E3 Adapter card
- 16-port T1/E1 ASAP Adapter card, version 2
- 32-port T1/E1 ASAP Adapter card

The **mda-mode** command is used on the 10-port 1GigE/1-port 10GigE X-Adapter card to configure the card for either 10-port 1GigE mode or 1-port 10GigE mode (**x10-1gb-sfp** or **x1-10gb-sf+**).

The **mda-mode** command is used on the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card to configure the card for either 4-port OC3/STM1 mode or 1-port OC12/STM4 mode (**p4-oc3** or **p1-oc12**).

The **mda-mode** command is used on the Integrated Services card to configure the card for a SCADA application: (**mddb**, **pcm**, or **vcb**).

The following CLI syntax shows an example of configuring a chassis slot and card (to activate the IOM) and adapter cards on the 7705 SAR-8.

Example:

```
ALU-1>config# card 1
ALU-1>config>card# card-type iom-sar
ALU-1>config>card# mda 1
ALU-1>config>card>mda# mda-type a6-em
ALU-1>config>card>mda# exit
ALU-1>config>card# mda 2
ALU-1>config>card>mda# mda-type a4-oc3
ALU-1>config>card>mda# exit
ALU-1>config>card# mda 3
ALU-1>config>card>mda# mda-type a16-chds1
ALU-1>config>card>mda# exit
ALU-1>config>card# mda 4
ALU-1>config>card>mda# mda-type a4-chds3
ALU-1>config>card>mda# mda-mode cem-fr-hdlc-ppp
ALU-1>config>card>mda# exit
ALU-1>config>card# mda 5
ALU-1>config>card>mda# mda-type a8-eth
ALU-1>config>card>mda# exit
ALU-1>config>card# mda 6
ALU-1>config>card>mda# mda-type a2-choc3
ALU-1>config>card>mda# exit
ALU-1>config>card# exit
```

The following CLI syntax shows an example of configuring a chassis slot and card (to activate the IOM) and adapter cards on the 7705 SAR-18.

Example:

```
ALU-1>config# card 1
ALU-1>config>card# card-type iom-sar
ALU-1>config>card# mda 1
ALU-1>config>card>mda# mda-type aux-alarm
ALU-1>config>card>mda# exit
ALU-1>config>card# mda 2
ALU-1>config>card>mda# mda-type a8-ethv2
ALU-1>config>card>mda# exit
ALU-1>config>card# mda 2
ALU-1>config>card>mda# mda-type a8-ethv2
ALU-1>config>card>mda# exit
ALU-1>config>card# mda 3
ALU-1>config>card>mda# mda-type a8-ethv2
ALU-1>config>card>mda# exit
ALU-1>config>card# mda 4
ALU-1>config>card>mda# mda-type a8-ethv2
ALU-1>config>card>mda# exit
```

```
ALU-1>config>card# mda 5
ALU-1>config>card>mda# mda-type a8-ethv2
ALU-1>config>card>mda# exit
ALU-1>config>card# mda 6
ALU-1>config>card>mda# mda-type a32-chdslv2
ALU-1>config>card>mda# mda-mode cem-atm-ppp
ALU-1>config>card>mda# exit
ALU-1>config>card# mda 7
ALU-1>config>card>mda# mda-type a32-chdslv2
ALU-1>config>card>mda# mda-mode cem-atm-ppp
ALU-1>config>card>mda# exit
ALU-1>config>card# mda 8
ALU-1>config>card>mda# mda-type a32-chdslv2
ALU-1>config>card>mda# mda-mode cem-atm-ppp
ALU-1>config>card>mda# exit
ALU-1>config>card# mda 9
ALU-1>config>card>mda# mda-type a32-chdslv2
ALU-1>config>card>mda# mda-mode cem-atm-ppp
ALU-1>config>card>mda# exit
ALU-1>config>card# mda 10
ALU-1>config>card>mda# mda-type a4-oc3
ALU-1>config>card>mda# exit
ALU-1>config>card# mda 11
ALU-1>config>card>mda# mda-type a4-chds3
ALU-1>config>card>mda# mda-mode cem-fr-hdlc-ppp
ALU-1>config>card>mda# exit
ALU-1>config>card# mda 12
ALU-1>config>card>mda# exit
ALU-1>config>card# mda X1
ALU-1>config>card>mda# mda-type x-10GigE
ALU-1>config>card>mda# mda-mode x1-10gb-sf+
ALU-1>config>card>mda# exit
ALU-1>config>card# mda X2
ALU-1>config>card>mda# mda-type x-10GigE
ALU-1>config>card>mda# mda-mode x10-1gb-sfp
ALU-1>config>card>mda# exit
ALU-1>config>card# mda X3
ALU-1>config>card>mda# mda-type x-10GigE
ALU-1>config>card>mda# mda-mode x1-10gb-sf+
ALU-1>config>card>mda# exit
ALU-1>config>card# mda X4
ALU-1>config>card>mda# mda-type x-10GigE
ALU-1>config>card>mda# mda-mode x10-1gb-sfp
ALU-1>config>card>mda# exit
ALU-1>config>card# exit
```

3.11.1.2 Configuring Adapter Card Network Queue QoS Policies

Network queue QoS policies can optionally be applied to adapter cards. Network queue policies define the ingress network queuing at the adapter card node level. Network queue policy parameters are configured in the **config>qos** context. For more information on network queue policies, refer to the 7705 SAR Quality of Service Guide, “Network Queue QoS Policies”.

Queue policies do not apply to the Auxiliary Alarm card.

Use the following CLI syntax to configure network queue policies on an adapter card.

CLI Syntax:

```
config>card>mda#  
    network  
        ingress  
            queue-policy name  
        no shutdown  
no shutdown
```

3.11.1.3 Configuring Ring Adapter Card or Module Network and Network Queue QoS Policies

Network and network queue QoS policies can optionally be applied to a ring adapter card or module, such as the 2-port 10GigE (Ethernet) Adapter card or 2-port 10GigE (Ethernet) module.

Network policies define ring type network policies to a ring adapter card, where a ring type is a **network-policy-type**.

Network queue policies define the add/drop port network queuing at the adapter card node level.

Network and network queue policy parameters are configured in the **config>qos** context. For more information on network queue policies, refer to the 7705 SAR Quality of Service Guide, “Network QoS Policies” and “Network Queue QoS Policies”.

Use the following CLI syntax to configure network and network queue policies on an adapter card.

CLI Syntax:

```
config>card>mda#  
    network  
        ring  
            add-drop-port-queue-policy name  
            qos-policy network-policy-id
```

```
no shutdown
```

3.11.1.4 Configuring Adapter Card Fabric Statistics

The collection of fabric statistics can be enabled on an adapter card to report about the fabric traffic flow and potential discards.

Fabric statistics do not apply to the Auxiliary Alarm card.

Use the following syntax to configure fabric statistics on an adapter card.

CLI Syntax:

```
config>card>mda#  
[no] fabric-stats-enabled
```

3.11.1.5 Configuring Adapter Card Fabric Profile

Ingress fabric profiles can be configured on an adapter card, in either a network or access context, to allow network ingress to fabric shapers to be user-configurable at rates that provide up to 1 Gb/s switching throughput from the adapter card towards the fabric. For more information on fabric profiles, refer to the 7705 SAR Quality of Service Guide, “QoS Fabric Profiles”.

Fabric profiles do not apply to the Auxiliary Alarm card.

Use the following CLI syntax to assign a fabric profile on an adapter card.

CLI Syntax:

```
config>card>mda#  
mda-type type  
[no] fabric-stats-enabled  
network  
    ingress  
        fabric-policy <fabric-policy-id>  
        queue-policy <name>  
access  
    ingress  
        fabric-policy <fabric-policy-id>  
no shutdown
```

3.11.1.6 Configuring Adapter Card Clock Mode

Clocking mode is defined at the adapter card level. There are three clocking modes available: **differential**, **adaptive**, and **dcr-acr**, which is a mixture of both differential and adaptive. The **dcr-acr** option enables differential and adaptive clocking on different ports of the same card or chassis. Differential and dcr-acr clocking modes also support a configurable timestamp frequency. In order to carry differential clock recover information, the RTP header must be enabled on the SAP.

The following chassis, cards, and modules support all clocking modes:

- 16-port T1/E1 ASAP Adapter card, version 2
- 32-port T1/E1 ASAP Adapter card
- 7705 SAR-M (variants with T1/E1 ports)
- 7705 SAR-X
- 7705 SAR-A (variant with T1/E1 ports)
- T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module

When the timestamp frequency is configured for **differential** or **dcr-acr** mode on a 4-port T1/E1 and RS-232 Combination module, the configured value will take effect on both modules installed in the 7705 SAR-H.

The following chassis and cards support adaptive clocking mode only:

- 16-port T1/E1 ASAP Adapter card, version 1

The following cards support differential clocking mode only:

- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card (DS1/E1 channels)
- 4-port DS3/E3 Adapter card (clear channel DS3/E3 ports and DS1/E1 channels on channelized DS3 ports (E3 ports cannot be channelized)); differential clocking mode on DS1/E1 channels is supported only on the first three ports of the card

Use the following CLI syntax to configure adaptive clocking mode.

CLI Syntax: `config>card>mda#`
 `clock-mode adaptive`
 `no shutdown`

Use the following CLI syntax to configure differential clocking mode or a combination of differential and adaptive clocking modes with a timestamp frequency.

CLI Syntax: `config>card>mda#`
 `clock-mode {differential | dcr-acr} [timestamp-freq`
 `{19440 | 25000 | 77760 | 103680}]`
 `no shutdown`

3.11.1.7 Configuring Adapter Card Voice Attributes

Use the following CLI syntax to assign the type of companding law and signaling to be used on a 6-port E&M Adapter card installed in a 7705 SAR-8 and 7705 SAR-18 chassis.

CLI Syntax: `config>card>mda#`
 `mda-type a6-em`
 `voice`
 `companding-law {a-law | mu-law}`
 `signaling-type {type-1 | type-2 | type-v}`
 `no shutdown`

Use the following CLI syntax to assign the type of companding law to be used on the FXO and FXS ports on an 8-port Voice & Teleprotection card installed in a 7705 SAR-8 or 7705 SAR-18 chassis.

CLI Syntax: `config>card>mda#`
 `mda-type a8-vt`
 `voice`
 `companding-law {a-law | mu-law}`
 `no shutdown`

Use the following CLI syntax to assign the type of companding law to be used on the FXO ports on an 8-port FXO Adapter card installed in a 7705 SAR-8 or 7705 SAR-18 chassis.

CLI Syntax: `config>card>mda#`
 `mda-type a8-fxo`
 `voice`
 `companding-law {a-law | mu-law}`
 `no shutdown`

Use the following CLI syntax to assign the type of companding law to be used on the FXS ports on a 6-port FXS Adapter card installed in a 7705 SAR-8 or 7705 SAR-18 chassis.

CLI Syntax: config>card>mda#
 mda-type a6-fxs
 voice
 companding-law {a-law | mu-law}
 no shutdown

3.11.1.8 Configuring Ring Adapter Card or Module Parameters

Use the following CLI syntax to configure the adapter card or module parameters on the 2-port 10GigE (Ethernet) Adapter card or 2-port 10GigE (Ethernet) module.

CLI Syntax: config>card>mda#
 ring
 [no] disable-aging
 [no] disable-learning
 [no] discard-unknown-source
 fdb-table-high-wmark *high-water-mark*
 no fdb-table-high-wmark
 fdb-table-size *table-size*
 no fdb-table-size
 [no] mac-pinning port *port-id*
 remote-age *aging-timer*
 no remote-age
 [no] static-mac mac *ieee-address* port *port-id*
 [create]
 [no] shutdown

After configuring the adapter card or module, you can use the **config>card>mda>ring>info detail** command to display the information on the ring adapter card or module.

```
*A:7705:Sar18>config>card>mda>ring# info detail
-----
no disable-aging
no disable-learning
no discard-unknown-source
no remote-age
no fdb-table-size
no fdb-table-high-wmark
no mac-pinning port 1/11/1
no mac-pinning port 1/11/2
-----
*A:7705:Sar18>config>card>mda>ring#
```

3.11.1.9 Configuring Auxiliary Alarm Card, Chassis, and Ethernet Port External Alarm Parameters

Use the following CLI syntax to configure the external alarm parameters for the Auxiliary Alarm card, 7705 SAR Ethernet ports (supported on all platforms with Ethernet ports), and for the four alarm inputs on the fan module (for the 7705 SAR-8), alarm connector (for the 7705 SAR-M (all variants), 7705 SAR-Wx (all variants), 7705 SAR-H, 7705 SAR-Hc, and 7705 SAR-X), and alarm module (for the 7705 SAR-18).

The output commands apply to the Auxiliary Alarm card only. The **debounce** and **normally** commands do not apply to external alarm parameters configured on an Ethernet port.

CLI Syntax:

```

config# external-alarms
      alarm alarm-id
            chassis-alarms
            description description-string
            log
            severity {critical | major | minor | warning}
            thresholds
                  analog
                        level {lt | gt} millivolts
                  exit
            trigger [any | all] {alarm-input1 |
                                alarm-input2... | alarm-input8}
            exit
input alarm-input
      debounce seconds
      debounce detect detect-seconds clear
            clear-seconds
      description description-string
      name name-string
      normally {open | closed}
      shutdown
exit
output alarm-output
      description description-string
      name name-string
      shutdown
  
```

Example:

```

config# external-alarms input alarm.d-1
config# external-alarms input alarm.d-2
config# external-alarms input alarm.d-3
config# external-alarms input alarm.d-4
config# external-alarms input alarm-1/1.d-1 name dinput1
config# external-alarms input alarm-1/1.d-2 name dinput2
  
```

```
config# external-alarms input alarm-1/1.d-3 name dinput3
config# external-alarms input alarm-1/1.d-4 name dinput4
config# external-alarms input alarm-1/1.d-5 name dinput5
config# external-alarms input alarm-1/1.d-23 name
    dinput23
config# external-alarms input alarm-1/1.d-24 name
    dinput24
config# external-alarms output alarm-1/1.d-1 name
    dinput11
config# external-alarms output relay-1/1.d-2 name
    output2
config# external-alarms output relay-1/1.d-3 name
    output3
config# external-alarms output relay-1/1.d-4 name
    output4
config# external-alarms output relay-1/1.d-5 name
    output5
config# external-alarms output relay-1/1.d-2 name
    output2
config# external-alarms output relay-1/1.d-3 name
    output3
config# external-alarms output relay-1/1.d-4 name
    output4
config# external-alarms output relay-1/1.d-5 name
    output5
config>ext-alarms# alarm 1
config>ext-alarms>alarm# chassis-alarms
config>ext-alarms>alarm# log
config>ext-alarms>alarm# trigger all alarm-1/1.d-1
    alarm-1/1.d-2 alarm-1/1.d-3 alarm-1/1.d-4 alarm-1/1.d-5
    alarm-1/1.a-1
config>ext-alarms>alarm# exit
config>ext-alarms# alarm 2
config>ext-alarms>alarm# chassis-alarms
config>ext-alarms>alarm# no log
config>ext-alarms>alarm# trigger all alarm-1/1.d-1
    alarm-1/1.d-2 alarm-1/1.d-3 alarm-1/1.d-4
    alarm-1/1.d-23 alarm-1/1.d-24 alarm-1/1.a-1
    alarm-1/1.a-2
config>ext-alarms>alarm# exit
config>ext-alarms# alarm 3
config>ext-alarms>alarm# chassis-alarms
config>ext-alarms>alarm# log
config>ext-alarms>alarm# trigger any alarm-1/1.d-1
    alarm-1/1.d-2 alarm-1/1.d-3 alarm-1/1.d-4 alarm-1/1.d-5
    alarm-1/1.a-1 alarm-1/1.a-2 alarm.d-1 alarm.d-2
config>ext-alarms>alarm# exit
config>ext-alarms# alarm 4
config>ext-alarms>alarm# chassis-alarms
```

```

config>ext-alarms>alarm# log
config>ext-alarms>alarm# trigger any alarm-1/1.a-1
alarm-1/1.a-2 alarm.d-1 alarm.d-2 alarm.d-3 alarm.d-4
config>ext-alarms>alarm# severity major
config>ext-alarms>alarm# thresholds
config>ext-alarms>alarm>thresholds# analog level lt 4
config>ext-alarms>alarm>thresholds# exit
config>ext-alarms>alarm# exit
config>ext-alarms# exit

```

The following CLI syntax shows an example of configuring custom alarms on Ethernet ports.

Example:

```

config# external-alarms input port-1/1/5
config>ext-alarms>in# name "CABINET-DOOR"
config>ext-alarms>in# description "Front Panel Access
Door Sensor"
config>ext-alarms>in# exit
config# external-alarms input port-1/1/6
config>ext-alarms>in# name "REAR-PANEL"
config>ext-alarms>in# description "Rear Maintenance
Panel Sensor"
config>ext-alarms>in# exit
config# external-alarms alarm 1
config>ext-alarms>alarm# description "Local Security
Breach"
config>ext-alarms>alarm# trigger "CABINET-DOOR"
"REAR-PANEL"
config>ext-alarms>alarm# severity critical
config>ext-alarms>alarm# no shutdown
config>ext-alarms>alarm# exit

```

Use the **show external-alarms input** command to display Ethernet port alarm input information.

```

*ALU-A# show external-alarms input
=====
External Alarm Input Summary
=====

```

Input Id	Name	Type	Admin	Value	Alarm State
alarm.d-1		Digital-In	Up	Open	Ok
alarm.d-2		Digital-In	Up	Open	Ok
alarm.d-3		Digital-In	Up	Open	Ok
alarm.d-4		Digital-In	Up	Open	Ok
port-1/5/1	CABINET-DOOR	Oper-State	Up	Down	Alarm-Detected
port-1/6/1	REAR-PANEL	Oper-State	Up	Up	Ok

```

=====

```

3.11.1.10 Displaying Adapter Card Information

After performing the adapter card configuration, you can use the **config>card 1** and the **info** commands to display the information on the 7705 SAR-8.

```
ALU-1>config# card 1
ALU-1>config>card# info
#-----
echo "Card Configuration"
#-----
card 1
  card-type iom-sar
  mda 1
    mda-type a6-em
  exit
  mda 2
    mda-type a4-oc3
  exit
  mda 3
    mda-type a16-chds1
  exit
  mda 4
    mda-type a4-chds3
  exit
  mda 5
    mda-type a8-eth
  exit
  mda 6
    mda-type a2-choc3
  exit
exit
#-----
.....
ALU-1> config#
```

Use the **config>card 1** and the **info detail** commands to display the adapter card detailed configuration information on the 7705 SAR-8.

```
ALU-1>config# card 1
ALU-1>config>card# info detail
#-----
echo "Card Configuration"
#-----
card 1
  card-type iom-sar
  mda 1
    mda-type a6-em
    voice
      companding-law a-law
      signaling-type type-v
    exit
    no shutdown
  exit
  mda 2
    mda-type a4-oc3
    no fabric-stats-enabled
```

```
        network
            ingress
                fabric-policy 1
                queue-policy "default"
            exit
        exit
    access
        ingress
            fabric-policy 1
        exit
    exit
    no shutdown
exit
mda 3
    mda-type a16-chds1
    clock-mode adaptive
    no fabric-stats-enabled
    network
        ingress
            fabric-policy 1
            queue-policy "default"
        exit
    exit
    access
        ingress
            fabric-policy 1
        exit
    exit
    no shutdown
exit
mda 4
    no shutdown
    mda-type a4-chds3
    no fabric-stats-enabled
    network
        ingress
            fabric-policy 1
            queue-policy "default"
        exit
    exit
    access
        ingress
            fabric-policy 1
        exit
    exit
exit
mda 5
    mda-type a8-eth
    no fabric-stats-enabled
    network
        ingress
            fabric-policy 1
            queue-policy "default"
        exit
    exit
    access
        ingress
            fabric-policy 1
        exit
    exit
```

```

        exit
        no shutdown
    exit
    mda 6
        mda-type a2-choc3
        clock-mode adaptive
        no fabric-stats-enabled
        network
            ingress
                fabric-policy 1
                queue-policy "default"
            exit
        exit
    access
        ingress
            fabric-policy 1
        exit
    exit
    no shutdown
exit
no shutdown
exit
#-----
.....
ALU-1> config#

```

3.11.2 Configuring Ports

This section provides the CLI syntax and examples to configure the following:

- [Configuring APS Port Parameters](#)
- [Configuring a Microwave Link](#)
- [Configuring Ethernet Port Parameters](#)
- [Configuring DSL Port Parameters](#)
- [Configuring SONET/SDH Port Parameters](#)
- [Configuring Voice Ports](#)
- [Configuring Teleprotection Ports](#)
- [Configuring TDM PPP](#)
- [Configuring Channelized Ports](#)
- [Configuring Fractional T1/E1 Ports for PPP Encapsulation](#)
- [Configuring T1 Line Buildout](#)
- [Configuring TDM E1 SSM](#)
- [Configuring ATM Interface Parameters](#)
- [Configuring Multilink PPP Bundles](#)
- [Configuring MC-MLPPP](#)

- [Configuring LAG Parameters](#)
- [Configuring Multilink ATM Inverse Multiplexing \(IMA\) Groups](#)
- [Configuring SDI Ports for IPCP Encapsulation](#)
- [Configuring TDM and SDI Ports for Frame Relay Encapsulation](#)
- [Configuring TDM and SDI Ports for HDLC Encapsulation](#)
- [Configuring TDM and SDI Ports for Cisco HDLC Encapsulation](#)
- [Configuring GNSS Receiver Port Parameters](#)
- [Configuring Serial Ports for Raw Socket Transport](#)

3.11.2.1 Configuring APS Port Parameters

APS has the following configuration rules.

- A working port must be added first. Then a protection port can be added or removed at any time.
- The protection port must be removed from the configuration before the working port is removed.
- A protection port or working port must be shut down in the **config>port** *port-id* context before being removed from an APS group.
- A path cannot be configured on a port before the port is added to an APS group.
- A working port cannot be removed from an APS group until the APS port path is removed.
- When ports are added to an APS group, all path-level configurations are available only at the APS port level and configuration on the physical member ports is blocked.
- When a port is a protection circuit of an APS group, the configuration options available in the **config>port** *port-id* **sonet-sdh** context are not allowed for that port unless they are in the following exception list:
 - clock-source
 - [no] loopback
 - [no] report-alarm
 - section-trace
 - [no] threshold

SC-APS is supported in unidirectional or bidirectional mode on:

- 2-port OC3/STM1 Channelized Adapter cards for TDM CES (Cpipes) and TDM CESoETH with MEF 8 with DS3/DS1/E1/DS0 channels

- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter cards for MLPPP access ports or TDM CES (Cpipes) and TDM CESoETH (MEF 8) access ports with DS1/E1 channels, or on a network port configured for POS
- 4-port OC3/STM1 Clear Channel Adapter cards network side (configured for POS operation).

SC-APS with TDM access is supported on DS3, DS1, E1, and DS0 (64 kb/s) channels.

MC-APS is supported in bidirectional mode on:

- 2-port OC3/STM1 Channelized Adapter cards for TDM CES (Cpipes) and TDM CESoETH with MEF 8 with DS3/DS1/E1/DS0 channels
- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter cards for MLPPP access ports or CES (Cpipes) and TDM CESoETH (MEF 8) access ports with DS1/E1 channels.

MC-APS with TDM access is supported on DS3, DS1, E1, and DS0 (64 kb/s) channels. TDM SAP-to-SAP with MC-APS is not supported.

APS can be configured in SC-APS mode with both working and protection circuits on the same node, or in MC-APS mode with the working and protection circuits configured on separate nodes.

For SC-APS and MC-APS with MEF 8 services where the remote device performs source MAC validation, the MAC address of the channel group in each of the redundant interfaces may be configured to the same MAC address using the **mac** CLI command.

Use the following CLI syntax to configure APS port parameters for an SC-APS group.

CLI Syntax:

```

config# port aps-id
      aps
        hold-time-aps {[signal-fail sf-time]
                       [signal-degrade sd-time]}
        protect-circuit port-id
        rdi-alarms {suppress | circuit}
        revert-time minutes
        switching-mode {bi-directional | uni-1plus1}
        working-circuit port-id

```

The following CLI syntax shows an example of configuring ports for SC-APS. The only mandatory configuration required to create an SC-APS group is to configure the working and protection circuit.

Example:

```

config# port aps-1

```

```

config>port# aps
config>port>aps# switching-mode uni-1plus1
config>port>aps# working-circuit 1/2/4
config>port>aps# rdi-alarms circuit
config>port>aps# revert-time 5
config>port>aps# protect-circuit 1/3/4

```

Use the **config port info** command to display port configuration information.

```

ALU-B>config>port# info
-----
shutdown
aps
switching-mode uni-1plus1
revert-time 5
working-circuit 1/2/4
protect-circuit 1/3/4
exit
sonet-sdh
exit
-----

```

Use the following CLI syntax to configure APS port parameters for an MC-APS group.

CLI Syntax:

```

config# port aps-id
aps
    advertise-interval advertise-interval
    hold-time hold-time
    neighbor ip-address
    protect-circuit port-id
    rdi-alarms {suppress | circuit}
    revert-time minutes
    working-circuit port-id

```

The following CLI syntax shows an example of configuring an MC-APS working circuit on a node. The only mandatory configuration required to create an MC-APS group is to configure the working and protection circuit, and the neighbor address.

Example:

```

config# port aps-2
config>port# aps
config>port>aps# advertise-interval 25
config>port>aps# hold-time 75
config>port>aps# working-circuit 1/2/4
config>port>aps# neighbor 10.10.10.101
config>port>aps# rdi-alarms circuit
config>port>aps# revert-time 5

```

To complete the MC-APS configuration, log on to the protection node, configure an APS group with the same APS ID as the working group, and configure the protection circuit. The MC-APS signaling path is established automatically when APS groups with matching IDs are both configured.

The following CLI syntax shows an example of configuring an MC-APS protection circuit on a node.

Example:

```
config# port aps-2
config>port# aps
config>port>aps# protect-circuit 1/3/2
```

Use the **config port info** command to display port configuration information.

```
*A:7705:Dut-D# configure port aps-2
*A:7705:Dut-D>config>port# info
-----
aps
  neighbor 10.10.10.2
  protect-circuit 1/3/2
exit
sonet-sdh
  path sts1-1
    payload vt15
    no shutdown
  exit
  path vt15-1.1.1
    no shutdown
  exit
exit
tdm
  dsl 1.1.1
    channel-group 1
      encap-type cem
      timeslots 1-24
      no shutdown
    exit
    no shutdown
  exit
exit
no shutdown
-----
```

SC-APS and MC-APS on the 2-port OC3/STM1 Channelized Adapter card (access side) normally support only TDM CES (Cpipes). SC-APS and MC-APS support Epipes with TDM SAPs when the MEF 8 service is used. The following CLI syntax shows an example of TDM CESoETH with MEF 8 for APS.

```
*A:7705:Dut-D# configure service epipe 1
*A:7705:Dut-D>config>epipe# info
-----
epipe 1 customer 1 vpn 1 create
  description "Default epipe description for service id 1"
  endpoint "X" create
```

```

exit
endpoint "Y" create
exit
sap aps-1.1.1.1.1 endpoint "X" create
description "Default sap description for service id 1"
cem
    local-ecid 1
    remote-ecid 2
    remote-mac 00:00:00:00:00:02
exit
exit
spoke-sdp 2003:1 endpoint "Y" create
exit
spoke-sdp 2004:1001 endpoint "X" icb create
exit
spoke-sdp 2004:2001 endpoint "Y" icb create
exit
no shutdown
exit
-----

```

The following CLI syntax shows examples of typical configurations of SC-APS and MC-APS on MC-MLPPP access ports on a 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card.

SC-APS node:

```

=====
port bpggrp-ppp-1
    multilink-bundle
        working-bundle bundle-ppp-1/5.1
        protect-bundle bundle-ppp-1/6.1
    exit
exit

port aps-1
    aps
        working-circuit 1/5/1
        protect-circuit 1/6/4
    exit
    sonet-sdh
        path sts1-1
            no shutdown
        exit
        path vt15-1.1.1
            no shutdown
        exit
        path vt15-1.1.2
            no shutdown
        exit
        path vt15-1.1.3
            no shutdown
        exit
        path vt15-1.1.4
            no shutdown
        exit
        path vt15-1.2.1

```

```
        no shutdown
    exit
    path vt15-1.2.2
        no shutdown
    exit
    path vt15-1.2.3
        no shutdown
    exit
    path vt15-1.2.4
        no shutdown
    exit
tdm
    dsl 1.1.1
        channel-group 1
            encap-type ipcp
            no shutdown
        exit
        no shutdown
    exit
    dsl 1.1.2
        channel-group 1
            encap-type ipcp
            no shutdown
        exit
        no shutdown
    exit
    dsl 1.1.3
        channel-group 1
            encap-type ipcp
            no shutdown
        exit
        no shutdown
    exit
    dsl 1.1.4
        channel-group 1
            encap-type ipcp
            no shutdown
        exit
        no shutdown
    exit
    dsl 1.2.1
        channel-group 1
            encap-type ipcp
            no shutdown
        exit
        no shutdown
    exit
    dsl 1.2.2
        channel-group 1
            encap-type ipcp
            no shutdown
        exit
        no shutdown
    exit
    dsl 1.2.3
        channel-group 1
            encap-type ipcp
            no shutdown
        exit
```

```

        no shutdown
    exit
    ds1 1.2.4
        channel-group 1
            encap-type ipcp
            no shutdown
        exit
    no shutdown
    exit

port bpgrp-ppp-1
    multilink-bundle
        mlppp
            endpoint-discriminator class ip-address discriminator-id 1.2.3.4
            multiclass 4
        exit
        member aps-1.1.1.1.1
        member aps-1.1.1.2.1
        member aps-1.1.1.3.1
        member aps-1.1.1.4.1
        member aps-1.1.2.1.1
        member aps-1.1.2.2.1
        member aps-1.1.2.3.1
        member aps-1.1.2.4.1
    exit
    no shutdown
    exit
port bundle-ppp-1/5.1
    no shutdown
    exit
port bundle-ppp-1/6.1
    no shutdown
    exit
service
    customer 1 create
        description "Default customer"
    exit
    ipipe 1 customer 1 vpn 1 create
        description "Default ipipe description for service id 1"
        sap 1/2/8:501 create
            description "Default sap description for service id 1"
            ce-address 99.99.1.2
        exit
        sap bpgrp-ppp-1 create
            description "Default sap description for service id 1"
            ce-address 99.99.1.1
            ipcp
        exit
    exit
    no shutdown
    exit

```

MC-APS working node:

```

=====
port bpgrp-ppp-1
    multilink-bundle
        working-bundle bundle-ppp-1/9.1

```

```
exit
exit
port aps-1
  aps
    neighbor 10.10.10.4
    working-circuit 1/9/2
  exit
sonet-sdh
  path sts1-1
    no shutdown
  exit
  path vt15-1.1.1
    no shutdown
  exit
  path vt15-1.1.2
    no shutdown
  exit
  path vt15-1.1.3
    no shutdown
  exit
  path vt15-1.1.4
    no shutdown
  exit
  path vt15-1.2.1
    no shutdown
  exit
  path vt15-1.2.2
    no shutdown
  exit
  path vt15-1.2.3
    no shutdown
  exit
  path vt15-1.2.4
    no shutdown
  exit
tdm
  ds1 1.1.1
    channel-group 1
    encaps-type ipcp
    no shutdown
  exit
  no shutdown
exit
  ds1 1.1.2
    channel-group 1
    encaps-type ipcp
    no shutdown
  exit
  no shutdown
exit
  ds1 1.1.3
    channel-group 1
    encaps-type ipcp
    no shutdown
  exit
  no shutdown
exit
  ds1 1.1.4
    channel-group 1
```



```
        encap-type ipcp
        no shutdown
    exit
    no shutdown
exit
dsl 1.2.1
    channel-group 1
        encap-type ipcp
        no shutdown
    exit
    no shutdown
exit
dsl 1.2.2
    channel-group 1
        encap-type ipcp
        no shutdown
    exit
    no shutdown
exit
dsl 1.2.3
    channel-group 1
        encap-type ipcp
        no shutdown
    exit
    no shutdown
exit
dsl 1.2.4
    channel-group 1
        encap-type ipcp
        no shutdown
    exit
    no shutdown
exit
port bggrp-ppp-1
    multilink-bundle
        mlppp
            endpoint-discriminator class ip-address discriminator-id 1.2.3.4
            multiclass 4
        exit
        member aps-1.1.1.1.1
        member aps-1.1.1.2.1
        member aps-1.1.1.3.1
        member aps-1.1.1.4.1
        member aps-1.1.2.1.1
        member aps-1.1.2.2.1
        member aps-1.1.2.3.1
        member aps-1.1.2.4.1
    exit
    no shutdown
exit
port bundle-ppp-1/9.1
    no shutdown
exit
service
    sdp 3001 create
        description "LDP_SdpToDut-A"
        far-end 10.10.10.1
        ldp
        keep-alive
```

```

        shutdown
    exit
    no shutdown
exit
sdp 3004 create
    description "LDP_SdpToDut-D"
    far-end 10.10.10.4
    ldp
    keep-alive
        shutdown
    exit
    no shutdown
exit
customer 1 create
    description "Default customer"
exit
ipipe 1 customer 1 vpn 1 create
    description "Default ipipe description for service id 1"
    endpoint "X" create
    exit
    endpoint "Y" create
    exit
    sap bpgrp-ppp-1 endpoint "X" create
        description "Default sap description for service id 1"
        ce-address 99.99.1.2
        ipcp
    exit
    exit
    spoke-sdp 3001:1 endpoint "Y" create
        ce-address 99.99.1.1
        no shutdown
    exit
    spoke-sdp 3004:1001 endpoint "X" icb create
        no shutdown
    exit
    spoke-sdp 3004:2001 endpoint "Y" icb create
        no shutdown
    exit
    no shutdown
exit

```

MC-APS protection node:

```

=====
    port bpgrp-ppp-1
        multilink-bundle
        protect-bundle bundle-ppp-1/9.1
    exit
exit
port aps-1
    aps
        neighbor 10.10.10.3
        protect-circuit 1/9/4
    exit
    sonet-sdh
        path sts1-1
        no shutdown
    exit

```

```
path vt15-1.1.1
  no shutdown
exit
path vt15-1.1.2
  no shutdown
exit
path vt15-1.1.3
  no shutdown
exit
path vt15-1.1.4
  no shutdown
exit
path vt15-1.2.1
  no shutdown
exit
path vt15-1.2.2
  no shutdown
exit
path vt15-1.2.3
  no shutdown
exit
path vt15-1.2.4
  no shutdown
exit
tdm
dsl 1.1.1
  channel-group 1
  encap-type ipcp
  no shutdown
exit
  no shutdown
exit
dsl 1.1.2
  channel-group 1
  encap-type ipcp
  no shutdown
exit
  no shutdown
exit
dsl 1.1.3
  channel-group 1
  encap-type ipcp
  no shutdown
exit
  no shutdown
exit
dsl 1.1.4
  channel-group 1
  encap-type ipcp
  no shutdown
exit
  no shutdown
exit
dsl 1.2.1
  channel-group 1
  encap-type ipcp
  no shutdown
exit
  no shutdown
```

```
        exit
    ds1 1.2.2
        channel-group 1
        encaps-type ipcp
        no shutdown
    exit
    no shutdown
exit
ds1 1.2.3
    channel-group 1
    encaps-type ipcp
    no shutdown
    exit
    no shutdown
exit
ds1 1.2.4
    channel-group 1
    encaps-type ipcp
    no shutdown
    exit
    no shutdown
exit
port bpggrp-ppp-1
    multilink-bundle
    mlppp
        endpoint-discriminator class ip-address discriminator-id 1.2.3.4
        multiclass 4
    exit
    member aps-1.1.1.1.1
    member aps-1.1.1.2.1
    member aps-1.1.1.3.1
    member aps-1.1.1.4.1
    member aps-1.1.2.1.1
    member aps-1.1.2.2.1
    member aps-1.1.2.3.1
    member aps-1.1.2.4.1
    exit
    no shutdown
exit
port bundle-ppp-1/9.1
    no shutdown
exit
service
    sdp 4001 create
        description "LDP_SdpToDut-A"
        far-end 10.10.10.1
        ldp
        keep-alive
        shutdown
    exit
    no shutdown
exit
    sdp 4003 create
        description "LDP_SdpToDut-C"
        far-end 10.10.10.3
        ldp
        keep-alive
        shutdown
    exit
```

```

        no shutdown
    exit
    customer 1 create
        description "Default customer"
    exit
    ipipe 1 customer 1 vpn 1 create
        description "Default ipipe description for service id 1"
        endpoint "X" create
    exit
        endpoint "Y" create
    exit
    sap bpggrp-ppp-1 endpoint "X" create
        description "Default sap description for service id 1"
        ce-address 99.99.1.2
        ipcp
    exit
    exit
    spoke-sdp 4001:1 endpoint "Y" create
        ce-address 99.99.1.1
        no shutdown
    exit
    spoke-sdp 4003:1001 endpoint "Y" icb create
        no shutdown
    exit
    spoke-sdp 4003:2001 endpoint "X" icb create
        no shutdown
    exit
    no shutdown
exit

```

Pseudowire redundancy node:

```

=====
service
    sdp 1003 create
        description "LDP_SdpToDut-C"
        far-end 10.10.10.3
        ldp
        keep-alive
        shutdown
    exit
    no shutdown
exit
    sdp 1004 create
        description "LDP_SdpToDut-D"
        far-end 10.10.10.4
        ldp
        keep-alive
        shutdown
    exit
    no shutdown
exit
    customer 1 create
        description "Default customer"
    exit
    ipipe 1 customer 1 vpn 1 create
        description "Default ipipe description for service id 1"
        endpoint "Y" create

```

```

        revert-time 5
        standby-signaling-master
    exit
    sap 1/2/1:501 create
        description "Default sap description for service id 1"
        ce-address 99.99.1.1
    exit
    spoke-sdp 1003:1 endpoint "Y" create
        ce-address 99.99.1.2
        precedence primary
        no shutdown
    exit
    spoke-sdp 1004:1 endpoint "Y" create
        ce-address 99.99.1.2
        precedence 1
        no shutdown
    exit
    no shutdown
exit

```

3.11.2.2 Configuring a Microwave Link

A microwave link can be configured on a 7705 SAR-8 or 7705 SAR-18 in order to support a microwave connection from ports 1 through 4 on a Packet Microwave Adapter card to an MPR-e radio that may be configured in standalone mode or Single Network Element (Single NE) mode.

Use the following CLI syntax to configure a microwave link (in the example, the MPR-e radios are configured in standalone mode):

CLI Syntax:

```

config# port mw-link-id
[no] shutdown
    mw
        [no] hold-time {up hold-time-up | down
            hold-time-down}
        [no] peer-discovery
        [no] protection
        radio port-id main create
            [no] database filename
            name name-string
            standalone
            [no] tx-mute
        radio port-id spare create
            [no] database filename
            name name-string
            standalone
            [no] tx-mute
        [no] revert rps eps

```

The following CLI syntax shows an example of configuring a microwave link on the 7705 SAR-8; the MPR-e radios are in standalone mode.

Example:

```

config# port mw-link-24
config>port# no shutdown
config>port# mw
config>port>mw# hold-time up 0 down 0
config>port>mw# no peer-discovery
config>port>mw# protection
config>port>mw# radio 1/2/3 main create
config>port>mw>radio# database mwLink1.tar
config>port>mw>radio# name radiomain
config>port>mw>radio# standalone
config>port>mw>radio# tx-mute
config>port>mw>radio# exit
config>port>mw# radio 1/2/3 spare create
config>port>mw>radio# database mwLink1.tar
config>port>mw>radio# name radiospare
config>port>mw>radio# standalone
config>port>mw>radio# tx-mute
config>port>mw>radio# exit
config>port>mw# revert rps eps
config>port>mw# exit
config>port# exit

```

3.11.2.3 Configuring Ethernet Port Parameters

Use the following CLI syntax to configure Ethernet network and access port parameters. For more information on the **dot1x** command, see [Configuring 802.1x Authentication Port Parameters](#). For more information on the **mac-auth** and **mac-auth-wait** commands, see [Configuring MAC Authentication Port Parameters](#).

CLI Syntax:

```

config# port port-id
    ethernet
        access
            egress
                unshaped-sap-cir cir-rate
            autonegotiate limited
            cfm-loopback priority {low | high | dot1p}
                [match-vlan {vlan-range | none}]
            crc-monitor
                sd-threshold threshold [multiplier multiplier]
                no sd-threshold
                sf-threshold threshold [multiplier multiplier]
                no sf-threshold
                window-size seconds

```

```

        no window-size
    dot1q-etype 0x0600..0xffff
    dot1x
        [no] mac-auth
        mac-auth-wait seconds
        no mac-auth-wait
        [no] max-auth-req max-auth-request
        [no] port-control {auto | force-auth |
            force-unauth}
        [no] quiet-period seconds
        [no] radius-plcy name
        [no] re-auth-period seconds
        [no] re-authentication
        [no] server-timeout seconds
        [no] supplicant-timeout seconds
        [no] transmit-period seconds
    down-when-looped
        [no] keep-alive timer
        [no] retry-timeout timer
        [no] shutdown
        [no] use-broadcast-address
    duplex {full|half}
    efm-oam
        [no] accept-remote-loopback
        mode {active|passive}
        [no] shutdown
        [no] transmit-interval interval [multiplier
            multiplier]
        [no] tunneling
    egress-rate sub-rate [include-fcs]
        [allow-eth-bn-rate-changes] [hold-time
            hold-time]
    encap-type {dot1q|null|qinq}
    hold-time hold-time [up hold-time-up | down
        hold-time-down]
    ingress-rate ingress-rate cbs {size [bytes |
        kilobytes] | default}
    no ingress-rate
        src-pause
        no src-pause
    lacp-tunnel
    lldp
        dest-mac
    loopback {line | internal} {timer {0 | 30..86400} |
        persistent} [swap-src-dst-mac]
    no loopback
    mac ieee-address
    mode {access | network | hybrid}
    mtu mtu-bytes

```



```

network
    accounting-policy policy-id
    [no] collect-stats
    queue-policy name
    scheduler-mode {profile | 4-priority |
        16-priority}
    phy-tx-clock {auto-pref-master | auto-pref-slave |
        slave | master}
    no phy-tx-clock
    poe {plus}
    no poe
    ptp-asymmetry nano-seconds
    no ptp-asymmetry
    qinq-etype 0x0600..0xffff
    report-alarm [signal-fail] [remote] [local]
        [no-frame-lock] [high-ber]
    speed {10|100|1000}
    ssm
        code-type {sonet | sdh}
        [no] shutdown
        [no] tx-dus
    vlan-filter filter-id
    no vlan-filter
    xgig {lan | wan}
    xor-mode {rj45 | sfp}

```

3.11.2.3.1 Configuring an Ethernet Network Port

A network port is network facing and participates in the service provider transport or infrastructure network processes.

Use the following basic CLI syntax to configure Ethernet network mode port parameters.

CLI Syntax:

```

port port-id
ethernet
    mode {network}
    network
        accounting-policy policy-id
        [no] collect-stats
        queue-policy name
        scheduler-mode {profile | 4-priority |
            16-priority}

```

The following CLI syntax shows an example of configuring an Ethernet port for network mode.

Example:

```
config# port 1/1/1
config>port# description "Ethernet network port"
config>port# ethernet
config>port>ethernet# mode network
config>port>ethernet# exit
config>port># no shutdown
```

Use the **config port info** command to display port configuration information.

```
ALU-B>config>port# info
-----
description "Ethernet network port"
ethernet
exit
no shutdown
-----
```

3.11.2.3.2 Configuring an Ethernet Access Port

Services are configured on access ports used for customer-facing traffic. If a Service Access Point (SAP) is to be configured on a port, it must be configured for access mode.

When a port is configured for access mode, the appropriate encapsulation type can be specified to distinguish the services on the port. Once a port has been configured for access mode, multiple services may be configured on the port.

Use the following basic CLI syntax to configure Ethernet access mode port parameters

CLI Syntax:

```
port port-id
mode {access}
encap-type {dot1q | null | qinq}
```

The following CLI syntax shows an example of configuring an Ethernet port for access mode.

Example:

```
config# port 1/1/2
config>port# description "Ethernet access port"
config>port# ethernet
config>port>ethernet# mode access
config>port>ethernet# encap-type dot1q
config>port>ethernet# exit
config>port# no shutdown
```

Use the **config port info** command to display port configuration information.

```
ALU-A>config>port# info
-----
      description "Ethernet access port"
      ethernet
        mode access
        encap-type dot1q
      exit
      no shutdown
-----
ALU-A>config>port#
```

3.11.2.3.3 Configuring a Hybrid Ethernet Port

A hybrid Ethernet port allows the combination of network and access modes of operation on a per-VLAN basis and must be configured for either dot1q or qinq encapsulation.

A hybrid mode port must use dot1q encapsulation to be configured as a network IP interface. Attempting to specify a qinq-encapsulated hybrid port as the port of a network interface is blocked.

Once a port has been configured for hybrid mode, multiple services may be configured on the port.

Use the following basic CLI syntax to configure hybrid mode port parameters.

CLI Syntax:

```
port port-id
  mode {hybrid}
  encap-type {dot1q | qinq}
```

The following CLI syntax shows an example of configuring a hybrid port for access mode.

Example:

```
config# port 1/1/5
config>port# description "hybrid Ethernet port"
config>port# ethernet
config>port>ethernet# mode hybrid
config>port>ethernet# encap-type dot1q
config>port>ethernet# exit
config>port# no shutdown
```

Use the **config port info** command to display port configuration information.

```
ALU-A>config>port# info
-----
      description "hybrid Ethernet port"
      ethernet
        mode hybrid
        encap-type dot1q
-----
```

```

        exit
        no shutdown
    -----
    ALU-A>config>port#

```

3.11.2.3.4 Configuring 802.1x Authentication Port Parameters

The 7705 SAR supports network access control of client devices (for example, PCs and STBs) on an Ethernet network using the IEEE 802.1x standard. 802.1x is a standard for authenticating customer devices before they can access the network. Authentication is performed using Extensible Authentication Protocol (EAP) over LAN (EAPOL).

802.1x provides protection against unauthorized access by forcing the device connected to the 7705 SAR to go through an authentication phase before it is able to send any non-EAP packets. Only EAPOL frames can be exchanged between the aggregation device (authenticator; for example, the 7705 SAR) and the customer device (supplicant) until authentication is successfully completed.

Use the following CLI syntax to configure an 802.1x Ethernet port:

CLI Syntax:

```

port port-id ethernet
    dot1x
        max-auth-req max-auth-request
        port-control {auto | force-auth | force-unauth}
        quiet-period seconds
        radius-plcy name
        re-authentication
        re-auth-period seconds
        server-timeout seconds
        supplicant-timeout seconds
        transmit-period seconds

```

The following CLI syntax shows an example of configuring an 802.1x Ethernet port:

Example:

```

config# port 1/5/2 ethernet dot1x
config>port>ethernet>dot1x# port-control auto
config>port>ethernet>dot1x# radius-plcy dot1xpolicy
config>port>ethernet>dot1x# re-auth-period 3500
config>port>ethernet>dot1x# transmit-period 30
config>port>ethernet>dot1x# quiet-period 50
config>port>ethernet>dot1x# supplicant-timeout 30
config>port>ethernet>dot1x# server-timeout 30

```

Use the **config port info** command to display port configuration information.

```

ALU-A>config>port>ethernet>dot1x# info detail

```

```

-----
    port-control auto
    radius-plcy dot1xpolicy
    re-authentication
    re-auth-period 3600
    max-auth-req 2
    transmit-period 30
    quiet-period 60
    supplicant-timeout 30
    server-timeout 30
    no mac-auth
    no mac-auth-wait
-----
ALU-A>config>port>ethernet>dot1x#

```

3.11.2.3.5 Configuring MAC Authentication Port Parameters

The 7705 SAR supports a fallback MAC authentication mechanism for client devices (for example, PCs and STBs) on an Ethernet network that do not support 802.1x EAP.

MAC authentication provides protection against unauthorized access by forcing the device connected to the 7705 SAR to have its MAC address authenticated by a RADIUS server before it is able to transmit packets through the 7705 SAR.

Use the following CLI syntax to configure MAC authentication for an Ethernet port:

CLI Syntax:

```

port port-id ethernet
    dot1x
        mac-auth
        mac-auth-wait seconds
        port-control auto
        quiet-period seconds
        radius-plcy name

```

The following CLI syntax shows an example of configuring MAC authentication for an Ethernet port:

Example:

```

config# port 1/5/2 ethernet dot1x
config>port>ethernet>dot1x# mac-auth
config>port>ethernet>dot1x# mac-auth-wait 20
config>port>ethernet>dot1x# port-control auto
config>port>ethernet>dot1x# quiet-period 60
config>port>ethernet>dot1x# radius-plcy dot1xpolicy

```

Use the **info detail** command to display port configuration information.

```

ALU-A>config>port>ethernet>dot1x# info detail
-----

```

```

port-control auto
radius-plcy dot1xpolicy
re-authentication
re-auth-period 3600
max-auth-req 2
transmit-period 30
quiet-period 60
supplicant-timeout 30
server-timeout 30
mac-auth
mac-auth-wait 20
-----
ALU-A>config>port>ethernet>dot1x#

```

3.11.2.4 Configuring DSL Port Parameters

Use the following CLI syntax to configure DSL port parameters.

CLI Syntax:

```

config# port port-id
dsl
    adsl2plus {g992-5-a | g992-5-b}
    atm-pvc
    cfm-loopback priority {low | high}
    dot1q-etype
    efm-oam
        accept-remote-loopback
        hold-time time-value
        [no] hold-time
        mode {active | passive}
        no shutdown
        transmit-interval interval [multiplier
            multiplier]
        tunneling
    egress-rate sub-rate
    encap-type {dot1q | null | qinq}
    hold-time {up hold-time-up | down hold-time-down}
    lacp-tunnel
    line number
        no shutdown
    loopback {internal} {timer {0 | 30..86400}}
    mac ieee-address
    mode {access | network}
    mtu mtu-bytes
    network
        accounting-policy policy-id
        [no] collect-stats
        queue-policy name
    qinq-etype 0x0600..0xffff
    ssm

```

```
code-type {sonet | sdh}  
no shutdown
```

3.11.2.4.1 Configuring a DSL Network Port

A network port is network-facing and participates in the service provider transport or infrastructure network processes.

Use the following CLI syntax to configure DSL network port parameters.

CLI Syntax:

```
port port-id  
    dsl  
        mode network  
        network  
            accounting-policy policy-id  
            [no] collect-stats  
            queue-policy name
```

The following CLI syntax shows an example of configuring a DSL port for network mode.

Example:

```
config# port 1/3/1  
config>port# description "DSL network port"  
config>port# dsl  
config>port>dsl# mode network  
config>port>dsl# exit  
config>port># no shutdown
```

Use the **config port info** command to display port configuration information.

```
ALU-B>config>port>dsl# info  
-----  
description "DSL network port"  
dsl  
exit  
no shutdown  
-----
```

3.11.2.4.2 Configuring a DSL Access Port

Services are configured on access ports used for customer-facing traffic. If a Service Access Point (SAP) is to be configured on a port, it must be configured for access mode.

When a port is configured for access mode, the appropriate encapsulation type can be specified to distinguish the services on the port. Once a port has been configured for access mode, multiple services may be configured on the port.

QinQ encapsulation type is supported on the DSL block on the 7705 SAR-Wx. However, it is not supported on the DSL Module on the 7705 SAR-M.

Use the following CLI syntax to configure a DSL port for access mode.

CLI Syntax:

```
port port-id
    dsl
        mode access
        encap-type {dot1q | null | qinq}
```

The following CLI syntax shows an example of configuring a DSL port for access mode.

Example:

```
config# port 1/3/1
config>port# description "DSL access port"
config>port# dsl
config>port>dsl# mode access
config>port>dsl# encap-type dot1q
config>port>dsl# exit
config>port# no shutdown
```

Use the **config port info** command to display port configuration information.

```
ALU-A>config>port>dsl# info
-----
description "DSL access port"
dsl
    mode access
    encap-type dot1q
exit
no shutdown
-----
ALU-A>config>port#
```

3.11.2.5 Configuring SONET/SDH Port Parameters

Use the following CLI syntax to configure SONET/SDH port parameters on a 4-port OC3/STM1 Clear Channel Adapter card.

CLI Syntax:

```
[no] port port-id
    sonet-sdh
        clock-source {loop-timed | node-timed}
        framing {sonet | sdh}
```



```

hold-time {[up hold-time-up] [down
    hold-time-down]}
no hold-time
loopback {line | internal}
no loopback
[no] path [sonet-sdh-index]
    atm
        cell-format cell-format
        min-vp-vpi value
    crc {16 | 32}
    description description
    no description
    encap-type {atm | ppp-auto}
    mode {access | network}
    mtu mtu
    no mtu
    network
        accounting-policy policy-id
        [no] collect-stats
        queue-policy name
        no queue-policy
    payload
    ppp
        keepalive time-interval [dropcount
            drop-count]
        no keepalive
    [no] report-alarm [pais] [plop] [prdi]
        [pplm] [prei] [puneq]
    [no] scramble
    [no] shutdown
    signal-label value
    no signal-label
    trace-string [trace-string]
    no trace-string
    [no] report-alarm [loc] [lais]
        [lrldi] [lb2er-sd] [lb2er-sf] [slof] [slos]
        [lrei]
    section-trace {increment-z0 | byte value |
        string string}
    speed {oc3}
    no speed
    threshold {ber-sd | ber-sf} rate threshold
    [no] no tx-dus

```

Use the following CLI syntax to configure SONET/SDH port parameters on a 2-port OC3/STM1 Channelized Adapter card.

CLI Syntax: port *port-id*
 sonet-sdh

```

clock-source {loop-timed | node-timed}
framing {sonet | sdh}
group sonet-sdh-index payload {tu3 | vt2 |
    vt15}
hold-time {[up hold-time-up] [down
    hold-time-down]}
no hold-time
loopback {line | internal}
no loopback
path
    description description-string
    no description
    report-alarm [pais] [plop] [prdi] [pplm]
        [prei] [puneq]
    no shutdown
    signal-label value
    no signal-label
    trace-string [trace-string]
    no trace-string
report-alarm [loc] [lais] [lrdi] [lb2er-sd]
    [lb2er-sf] [slof] [slos] [lrei]
section-trace {increment-z0 | byte value |
    string string}
speed {oc3}
no speed
threshold {ber-sd | ber-sf} rate threshold
no tx-dus

```

3.11.2.5.1 Configuring a SONET/SDH Access Port

Use the following CLI syntax to configure a SONET/SDH access port on a 4-port OC3/STM1 Clear Channel Adapter card.

CLI Syntax:

```
port port-id
sonet-sdh
    path [sonet-sdh-index]
    encap-type atm
    [no] shutdown
```

The following CLI syntax shows an example of configuring a SONET/SDH access port on a 4-port OC3/STM1 Clear Channel Adapter card.

Example:

```
config# port 1/2/1
config>port# sonet-sdh
config>port>sonet-sdh# path
config>port>sonet-sdh>path# encap-type atm
config>port>sonet-sdh>path# no shutdown
config>port>sonet-sdh>path# exit
config>port>sonet-sdh# exit
config>port# exit
config#
```

Use the **config port info** command to display SONET/SDH port configuration information.

```
ALU-B>config>port# info
....
#-----
echo "Port Configuration"
#-----
....
    port 1/2/1
        shutdown
        sonet-sdh
            path
                encap-type atm
                atm
                exit
                no shutdown
            exit
        exit
    exit
....
```

Use the following CLI syntax to configure a SONET/SDH access port on a 2-port OC3/STM1 Channelized Adapter card.

CLI Syntax:

```

port port-id
    tdm
        ds1 ds1-id
            channel-group channel-group
            encap-type atm
            mode access
            [no] shutdown

```

The following CLI syntax shows an example of configuring a SONET/SDH access port on a 2-port OC3/STM1 Channelized Adapter card.

Example:

```

config# port 1/2/2
config>port# tdm
config>port>tdm#ds1 22
config>port>tdm>ds1# encap-type atm
config>port>tdm>ds1# mode access
config>port>tdm>ds1# no shutdown
config>port>tdm>ds1# exit
config>port>tdm># exit
config>port# exit

```

Use the following CLI syntax to configure a SONET/SDH access port on a 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card.

CLI Syntax:

```

port port-id
    tdm
        ds1 ds1-id
            channel-group channel-group
            encap-type cem
            mode access
            [no] shutdown

```

The following CLI syntax shows an example of configuring a SONET/SDH access port on a 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card.

Example:

```

config# port 1/2/3
config>port# tdm
config>port>tdm#ds1 24
config>port>tdm>ds1# encap-type cem
config>port>tdm>ds1# mode access
config>port>tdm>ds1# no shutdown
config>port>tdm>ds1# exit
config>port>tdm># exit
config>port# exit

```

Use the **config port info** command to display SONET/SDH port information.

```
ALU-B>config>port# info
....
#-----
echo "Port Configuration"
#-----
....
sonet-sdh
    path sts1-1
        payload vt15
        no shutdown
    exit
    path sts1-2
        no shutdown
    exit
    path vt15-1.1.1
        no shutdown
    exit
exit
tdm
    ds3 2
        channelized ds1
        no shutdown
    exit
    ds1 1.1.1
        channel-group 1
        encap-type atm
        atm
        exit
        no shutdown
    exit
    no shutdown
exit
    ds1 2.1
        channel-group 1
        encap-type atm
        atm
        exit
        no shutdown
    exit
    no shutdown
exit
exit
....
```

3.11.2.5.2 Configuring a SONET/SDH Network Port

Use the following CLI syntax to configure a SONET/SDH network port on a 4-port OC3/STM1 Clear Channel Adapter card.

CLI Syntax:

```

port port-id
    sonet-sdh
        path [sonet-sdh-index]
            encap-type ppp-auto
            mode network
            network
                accounting-policy policy-id
                [no] collect-stats
                queue-policy name
            [no] shutdown

```

The following CLI syntax shows an example of configuring a SONET/SDH network port on a 4-port OC3/STM1 Clear Channel Adapter card.

Example:

```

config# port 1/2/2
config>port# sonet-sdh
config>port>sonet-sdh# path
config>port>sonet-sdh>path# mode network
config>port>sonet-sdh>path# encap-type ppp-auto
config>port>sonet-sdh>path# no shutdown
config>port>sonet-sdh>path# exit
config>port>sonet-sdh# exit
config>port# exit
config#

```

Use the **config port info** command to display SONET/SDH port information for the configured port.

```

ALU-B>config>port# info
....
#-----
echo "Port Configuration"
#-----
....
    port 1/2/2
        sonet-sdh
            path
                no shutdown
                mode network
                encap-type ppp-auto
                network
                    queue-policy "default"
                exit
            exit
        exit
    no shutdown

```

```

    exit
....

```

Use the following CLI syntax to configure a SONET/SDH network port on a 2-port OC3/STM1 Channelized Adapter card.

CLI Syntax:

```

port port-id
    tdm
        ds1 ds1-id
            channel-group channel-group
            encap-type ppp-auto
            mode network
            [no] shutdown

```

The following CLI syntax shows an example of configuring a SONET/SDH network port on a 2-port OC3/STM1 Channelized Adapter card.

Example:

```

config# port 1/2/2
config>port# tdm
config>port>tdm#>ds1 22
config>port>tdm>ds1# encap-type ppp-auto
config>port>tdm>ds1# mode network
config>port>tdm>ds1# no shutdown
config>port>tdm>ds1# exit
config>port>tdm># exit
config>port# exit
config#

```

Use the **config port info** command to display SONET/SDH port information for the configured port.

```

ALU-B>config>port# info
....
#-----
echo "Port Configuration"
#-----
....
    port 1/2/2
        shutdown
        sonet-sdh
            encap-type
                ppp-auto
            mode
                network
            exit
            no shutdown
        exit
    exit
exit
....

```

3.11.2.6 Configuring Voice Ports

Use the following CLI syntax to configure an analog voice port on a 6-port E&M Adapter card.

CLI Syntax:

```

port port-id
voice
    audio-wires {four-wires | two-wires}
    [no] em
        [no] channel-group channel-group-id
        [no] description description-string
        [no] encap-type cem
        mode access
        [no] shutdown
    fault-signaling {idle | seized}
    [no] idle-code abcd-code
    [no] seized-code abcd-code
    [no] loopback {internal-analog |
        internal-digital}
    signaling-lead
        e {high | low | end-to-end}
        m {high | low | end-to-end}
    signaling-mode {em | transmission-only}
    [no] shutdown
tlp-rx {-16.0 | -15.9 | ... | 6.9 | 7.0}
tlp-tx {-16.0 | -15.9 | ... | 6.9 | 7.0}

```

The following CLI syntax shows an example of configuring an analog voice port on a 6-port E&M Adapter card. The default values are used for the commands that are not shown in the example.

Example:

```

config# port 1/1/1
config>port# voice
config>port>voice# em
config>port>voice# em# channel-group 1
config>port>voice# em# channel-group# mode access
config>port>voice# em# channel-group# encap-type cem
config>port>voice# em# channel-group# no shutdown
config>port>voice# em# channel-group# exit
config>port>voice# em# signaling-lead
config>port>voice# em# signaling-lead# e high
config>port>voice# em# signaling-lead# exit
config>port>voice# em# signaling-mode
config>port>voice# em# signaling-mode# em
config>port>voice# em# signaling-mode# exit
config>port>voice# em# no shutdown
config>port>voice# em# exit
config>port>voice# exit

```



```

config>port# no shutdown
config>port# exit
config#

```

Use the following CLI syntax to configure an analog voice port on an 8-port Voice & Teleprotection card.

CLI Syntax:

```

port port-id
  voice
    fxo
      channel-group channel-group-id
        description description-string
        encap-type {cem}
        mode access
        no shutdown
        fault-signaling {idle | seized}
        loopback {internal-digital}
        no shutdown
    fxs
      channel-group channel-group-id
        description description-string
        encap-type cem
        mode access
        no shutdown
        fault-signaling {idle | seized}
        loopback {internal-digital}
        ring-generation {16 | 20 | 25}
        no shutdown
        line-balance {nominal | 800 | short | long}
        signaling-type {3600plar | 1511plar | 3600ls |
          1511profile1 | 3600re}
        tlp-rx decibels {-7.0 | -6.9 | ... | -0.1 | 0.0}
        tlp-tx decibels {-4.0 | -3.9 | ... | 2.9 | 3.0}

```

The following CLI syntax shows an example of configuring an analog voice port on an 8-port Voice & Teleprotection card. The default values are used for the commands that are not shown in the example.

Example:

```

config# port 1/1/6
config>port# voice
config>port>voice# fxo
config>port>voice>fxo# channel-group 1
config>port>voice>fxo>channel-group# mode access
config>port>voice>fxo>channel-group# encap-type cem
config>port>voice>fxo>channel-group# no shutdown
config>port>voice>fxo>channel-group# exit
config>port>voice>fxo# no shutdown
config>port>voice>fxo# exit

```

```

config>port>voice# exit
config>port# no shutdown
config>port# exit
config#

```

Use the following CLI syntax to configure an analog voice port on an 8-port FXO Adapter card.

CLI Syntax:

```

port port-id
    voice
        fxo
            channel-group channel-group-id
                description description-string
                encap-type cem
                mode access
                no shutdown
                fault-signaling {idle | seized}
                loopback internal-digital
                no shutdown
            line-balance {nominal | 800}
            signaling-type {3600ls | 1511profile1 | 3600re}
            tlp-rx decibels {-7.0 | -6.9 | ... | -0.1 | 0.0}
            tlp-tx decibels {-4.0 | -3.9 | ... | 2.9 | 3.0}

```

The following CLI syntax shows an example of configuring an analog voice port on an 8-port FXO Adapter card. The default values are used for the commands that are not shown in the example.

Example:

```

config# port 1/1/6
config>port# voice
config>port>voice# fxo
config>port>voice>fxo# channel-group 1
config>port>voice>fxo>channel-group# mode access
config>port>voice>fxo>channel-group# encap-type cem
config>port>voice>fxo>channel-group# no shutdown
config>port>voice>fxo>channel-group# exit
config>port>voice>fxo# no shutdown
config>port>voice>fxo# exit
config>port>voice# exit
config>port# no shutdown
config>port# exit
config#

```

Use the following CLI syntax to configure an analog voice port on a 6-port FXS Adapter card.

CLI Syntax:

```

port port-id
  voice
    fxs
      channel-group channel-group-id
        description description-string
        encap-type cem
        mode access
        no shutdown
        fault-signaling {idle | seized}
        loopback internal-digital
        no shutdown
        line-balance {nominal | 800}
        ring-generation {16 | 20 | 25}
        signaling-type {3600plar | 1511plar | 3600ls
          | 1511profile1 | 3600re}
        tlp-rx {-7.0 | -6.9 | ... | -0.1 | 0.0}
        tlp-tx {-4.0 | -3.9 | ... | 2.9 | 3.0}

```

The following CLI syntax shows an example of configuring an analog voice port on a 6-port FXS Adapter card.

Example:

```

config# port 1/6/1
config>port# voice
config>port>voice# fxs
config>port>voice>fxs# channel-group 1
config>port>voice>fxs>channel-group# mode access
config>port>voice>fxs>channel-group# encap-type cem
config>port>voice>fxs>channel-group# no shutdown
config>port>voice>fxs>channel-group# exit
config>port>voice>fxs# no shutdown
config>port>voice>fxs# exit
config>port>voice# line-balance nominal
config>port>voice# ring-generation 16
config>port>voice# signaling-type 3600ls
config>port>voice# tlp-rx -7.0
config>port>voice# tlp-tx -4.0
config>port>voice# exit
config>port# exit
config#

```

3.11.2.7 Configuring Teleprotection Ports

Use the following CLI syntax to configure a teleprotection port on an 8-port Voice & Teleprotection card.

CLI Syntax:

```

port port-id
    tdm
        codir
            channel-group channel-group-id
                description description-string
                encap-type cem
                mode access
                no shutdown
            loopback {internal | line}
            report-alarm {ais | los}
            no shutdown
        tpif
            channel-group channel-group-id
                description description-string
                encap-type cem
                mode access
                no shutdown
                timeslots timeslots
            loopback {internal | line}
            report-alarm {los | rai}
            no shutdown

```

The following CLI syntax shows an example of configuring a teleprotection port on an 8-port Voice & Teleprotection card. The default values are used for the commands that are not shown in the example.

Example:

```

config# port 1/1/3
config>port# tdm
config>port>tdm>codir
config>port>tdm>codir# channel-group 1
config>port>tdm>codir>channel-group# mode access
config>port>tdm>codir>channel-group# encap-type cem
config>port>tdm>codir>channel-group# no shutdown
config>port>tdm>codir>channel-group# exit
config>port>tdm>codir>no shutdown
config>port>tdm>codir# exit
config>port>tdm# exit
config>port# no shutdown
config>port# exit
config#

```

3.11.2.8 Configuring TDM PPP

Use the following CLI syntax to configure PPP parameters for TDM DS3/E3 ports.

CLI Syntax:

```
port port-id
  tdm
    ds3
      encaps-type ppp-auto
      mode network
      ppp
        keepalive time-interval [dropcount
          drop-count]
        no keepalive
    e3
      encaps-type ppp-auto
      mode network
      ppp
        keepalive time-interval [dropcount
          drop-count]
        no keepalive
```

3.11.2.9 Configuring Channelized Ports

Channelized ports are supported on the following cards and module:

- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- 12-port Serial Data Interface card
- 6-port E&M Adapter card
- 2-port OC3/STM1 Channelized Adapter card
- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card
- 4-port DS3/E3 Adapter card
- 8-port Voice & Teleprotection card
- 4-port T1/E1 and RS-232 Combination module
- 8-port FXO Adapter card
- 6-port FXS Adapter card



Note: Ethernet ports cannot be channelized.

When configuring channelized ports, the port ID is specified in different ways depending on the TDM type and level of channelization, as follows:

- $N \times \text{DS0}$ in DS1 port.*channel-group*, where *channel-group* is 1 to 24
- $N \times \text{DS0}$ in E1 port.*channel-group*, where *channel-group* is 1 to 32
- $N \times \text{DS1}$ in DS3 port.*channel-group*, where *channel-group* is 1 to 24
- $N \times \text{E1}$ in E3 port.*channel-group*, where *channel-group* is 1 to 32
- $1 \times \text{DS0}$ in V.35, RS-232, or X.21 port.*channel-group*, where *channel-group* is 1
- $1 \times \text{DS0}$ in E&M, FXO, or FXS port.*channel-group*, where *channel-group* is 1
- $1 \times \text{DS0}$ in codirectional port.*channel-group*, where *channel-group* is 1
- $N \times \text{DS0}$ in TPIF port.*channel-group*, where *channel-group* is 1

3.11.2.9.1 Verifying the Adapter Card Type

To ensure that you have a channel-capable adapter card, verify the adapter card you are configuring by using the **show mda** command.

In the following example, mda 1, mda 3, mda 4, and mda 6 show channelized adapter cards on the 7705 SAR-8.

```
*A:ALU-1# show mda
=====
MDA Summary
=====
```

Slot	Mda	Provisioned Type Equipped Type (if different)	Admin State	Operational State
1	1	a12-sdiv2	up	up
	2	a4-oc3	up	up
	3	a16-chds1	up	up
	4	a4-chds3	up	up
	5	a8-eth	up	up
	6	a2-choc3	up	up

```
=====
*A:ALU-1
```

Use the **show mda detail** command to show detailed information for the channelized adapter cards shown in the previous example.

```
*A:ALU-1# show mda 1/1 detail
=====
MDA 1/1 detail
=====
```

Slot	Mda	Provisioned Type Equipped Type (if different)	Admin State	Operational State
1	1	a12-sdiv2	up	provisioned

```

MDA Specific Data
  Maximum port count      : 12
  Number of ports equipped : 12
  Network ingress queue policy : default
  Network ingress fabric policy : 1
  Access ingress fabric policy : 1
  Fabric Stats Enabled    : TRUE
  Capabilities            : Serial, CEM
  Min channel size        : PDH DS0 Group
  Max channel size        : Serial RS-232
  Max number of channels   : 12
  Channels in use         : 2

CEM MDA Specific Data
  Clock Mode              : n/a

Hardware Data
  Part number             :
  CLEI code               :
  Serial number           :
  Manufacture date        :
  Manufacturing string     :
  Manufacturing deviations :
  Administrative state    : up
  Operational state       : provisioned
  Software version        : N/A
  Time of last boot       : N/A
  Current alarm state     : alarm cleared
  Base MAC address       :
=====
*A:ALU-1#

*A:ALU-1# show mda 1/3 detail
=====
MDA 1/3 detail
=====
Slot  Mda   Provisioned Type              Admin   Operational
      Mda   Equipped Type (if different)  State   State
-----
1      3    a16-chds1                up      up

MDA Specific Data
  Maximum port count      : 16
  Number of ports equipped : 16
  Network ingress queue policy : default
  Network ingress fabric policy : 1
  Access ingress fabric policy : 1
  Fabric Stats Enabled    : FALSE
  Capabilities            : TDM, PPP, ATM, CEM
  Min channel size        : PDH DS0 Group
  Max channel size        : PDH DS1
  Max number of channels   : 256
  Channels in use         : 3

CEM MDA Specific Data
  Clock Mode              : adaptive

Hardware Data

```

```

Part number           : Sim Part#
CLEI code             : Sim CLEI
Serial number         : mda-3
Manufacture date      : 01012003
Manufacturing string   : Sim MfgString mda-3
Manufacturing deviations : Sim MfgDeviation mda-3
Administrative state   : up
Operational state     : up
Software version      : N/A
Time of last boot     : N/A
Current alarm state   : alarm active
Base MAC address      : a4:58:01:03:00:01
=====
*A:ALU-1#

*A:ALU-1# show mda 1/5 detail
=====
MDA 1/5 detail
=====
Slot  Mda  Provisioned Type                      Admin    Operational
      Mda  Equipped Type (if different)         State    State
-----
1      5      a2-choc3                          up        up

MDA Specific Data
Maximum port count      : 2
Number of ports equipped : 2
Network ingress queue policy : default
Network ingress fabric policy : 1
Access ingress fabric policy : 1
Fabric Stats Enabled    : FALSE
Capabilities            : Sonet, TDM, PPP, ATM
Min channel size        : PDH DS0 Group
Max channel size        : PDH DS3
Max number of channels   : 512
Channels in use         : 0

Hardware Data
Part number             : 3HE03127AAAB0102
CLEI code               : IPU3AFPEAA
Serial number           : NS092040281
Manufacture date        : 05192009
Manufacturing string     : ECO C03759
Manufacturing deviations :
Administrative state     : up
Operational state       : up
Temperature              : 37C
Temperature threshold    : 75C
Software version         : N/A
Time of last boot       : 2009/06/28 18:47:04
Current alarm state     : alarm cleared
Base MAC address        : 00:23:3e:99:7a:12
=====
*A:ALU-1#

```


On the 16-port T1/E1 ASAP Adapter card, 32-port T1/E1 ASAP Adapter card, 2-port OC3/STM1 Channelized Adapter card, 4-port DS3/E3 Adapter card, and T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module, DS0 channel groups and their parameters are configured in the DS1 or E1 context. For a DS1 channel group, up to 24 timeslots can be assigned (numbered 1 to 24). For an E1 channel group, up to 31 timeslots can be assigned (numbered 2 to 32). For ATM, all timeslots are auto-configured when a channel group gets created. The 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card supports channelization at the DS1/E1 level only.

On the 6-port E&M Adapter card, a single DS0 channel group and its parameters are configured in the E&M context. On the 12-port Serial Data Interface card and RS-232 ports of the 4-port T1/E1 and RS-232 Combination module, DS0 channel groups and their parameters are configured in the V.35, RS-232, or X.21 context. For RS-232, a single timeslot is auto-configured when a channel group is created. For V.35 and X.21, the number of timeslots auto-configured when a channel group is created depends on the interface speed. For the 8-port Voice & Teleprotection card, a single DS0 channel group and its parameters are configured in the codirectional, FXO or FXS context and up to 12 timeslots can be assigned for the TPIF context.

**Note:**

- Encapsulation type is configured at the DS1 or E1 level on the following:
 - 16-port T1/E1 ASAP Adapter card
 - 32-port T1/E1 ASAP Adapter card
 - 2-port OC3/STM1 Channelized Adapter card
 - 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card
 - 4-port DS3/E3 Adapter card
 - T1/E1 ports of the 4-port T1/E1 and RS-232 Combination module
- The encapsulation type is configured at the RS-232, V.35, or X.21 level for the following:
 - 12-port Serial Data Interface card
 - RS-232 ports of the 4-port T1/E1 and RS-232 Combination module
- A port can support only one encapsulation type. When the first channel group is configured for an encapsulation type, all other channel groups on the port are automatically configured with that encapsulation type. To change an encapsulation type, the channel group must be deleted, then recreated with the new encapsulation type.

The following is an example of an E1 channel group configuration.

```
ALU-A>config>port>tdm# e1
ALU-A>config>port>tdm>e1# channel-group 1
ALU-A>config>port>tdm>e1>channel-group# timeslots 2
ALU-A>config>port>tdm>e1>channel-group# no shutdown
ALU-A>config>port>tdm>e1>channel-group#
ALU-A>config>port>tdm>e1# no shutdown
ALU-A>config>port>tdm>e1# channel-group 2
ALU-A>config>port>tdm>e1>channel-group# timeslots 3,4
ALU-A>config>port>tdm>e1>channel-group# encap-type cem
ALU-A>config>port>tdm>e1>channel-group# no shutdown
ALU-A>config>port>tdm>e1>channel-group# exit
```

The following is an example of an RS-232 channel group configuration.

```
ALU-A>config>port 1/1/2
ALU-A>config>port# serial
ALU-A>config>port>serial# rs232
ALU-A>config>port>serial>rs232# channel-group 1
ALU-A>config>port>serial>rs232>channel-group# description "RS232GRP1"
ALU-A>config>port>serial>rs232>channel-group# encap-type cem
ALU-A>config>port>serial>rs232>channel-group# idle-payload-fill all-ones
ALU-A>config>port>serial>rs232>channel-group# no shutdown
ALU-A>config>port>serial>rs232>channel-group# exit
```

The following is an example of an E&M channel group configuration.

```
ALU-A>config>port 1/1/1
ALU-A>config>port# voice
ALU-A>config>port>voice# em
ALU-A>config>port>voice>em# channel-group 1
ALU-A>config>port>voice>em>channel-group# description "DS0GRP"
ALU-A>config>port>voice>em>channel-group# encap-type cem
ALU-A>config>port>voice>em>channel-group# mode access
ALU-A>config>port>voice>em>channel-group# no shutdown
ALU-A>config>port>voice>em>channel-group# exit
```

The following is an example of an FXO channel group configuration:

```
ALU-A>config# port 1/1/6
ALU-A>config>port# voice
ALU-A>config>port>voice# fxo
ALU-A>config>port>voice>fxo# channel-group 1
ALU-A>config>port>voice>fxo>channel-group# mode access
ALU-A>config>port>voice>fxo>channel-group# encap-type cem
ALU-A>config>port>voice>fxo>channel-group# no shutdown
config>port>voice>fxo>channel-group# exit
config>port>voice>fxo# no shutdown
config>port>voice>fxo# exit
config>port>voice# exit
config>port# no shutdown
config>port# exit
config#
```

The following is an example of an FXS channel group configuration:

```
ALU-A>config# port 1/6/1
ALU-A>config>port# voice
ALU-A>config>port>voice# fxs
ALU-A>config>port>voice>fxs>channel-group 1
ALU-A>config>port>voice>fxs>channel-group# mode access
ALU-A>config>port>voice>fxs>channel-group# encap-type cem
ALU-A>config>port>voice>fxs>channel-group# no shutdown
config>port>voice>fxs>channel-group# exit
config>port>voice>fxs# no shutdown
config>port>voice>fxs# exit
config>port>voice# exit
config>port# no shutdown
config>port# exit
config#
```

Services can now be applied to the configured channelized ports.

3.11.2.10 Configuring Fractional T1/E1 Ports for PPP Encapsulation

A T1 or E1 port can be configured to provide a subrate PPP service. That is, by using a channel group, the PPP service can be assigned to a subset of the timeslots that are available on the T1 or E1 port. Only one channel group can be configured per port for subrate PPP.

The following cards and platforms support fractional T1/E1 on a PPP channel group (encapsulation type ppp-auto), or all timeslots on T1/E1 ports, in network mode:

- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module (on 7705 SAR-H)
- T1/E1 ports on the 7705 SAR-A (variants with T1/E1 ports)
- T1/E1 ports on the 7705 SAR-M (variants with T1/E1 ports)
- T1/E1 ports on the 7705 SAR-X

You must then change the value of the timeslot configuration to specify the number of timeslots you want to use. Any timeslots not selected cannot be used.

Use the following CLI syntax to configure a T1/E1 port for fractional T1/E1.

First, configure the port:

```
CLI Syntax:  port port-id
                tdm
                e1
                channel-group channel-group-id
                encap-type ppp-auto
                mode network
                no shutdown
                exit
                no shutdown
            exit
        exit
    no shutdown
```

Use the **config port info** command to display port configuration information:

```
*A:ALU-A>config>port# info detail
-----
description "DS1/E1"
tdm
    e1
        shutdown
        framing g704
        no loopback
        clock-source node-timed
        no signal-mode
        report-alarm ais los
        no report-alarm oof rai looped ber-sd ber-sf
        no hold-time
        ssm
            shutdown
            ssm-bit 8
            no tx-dus
        channel-group 1
            shutdown
            description "DS0GRP"
            mode network
            encap-type ppp-auto
            no mtu
            network
                queue-policy "default"
            exit
            timeslots 2-32
            crc 16
            idle-cycle-flag flags
            no scramble
            ppp
                keepalive 10 dropcount 3
            exit
        exit
    exit
    line-impedance 120
exit
no shutdown
```

Next, change the value of the timeslots configuration (currently, all timeslots are allocated to this channel group):

CLI Syntax:

```
port port-id
    tdm
        e1
            channel-group 1
                timeslots 11-20
```

Use the **config port info** command to display the new port configuration information:

```
*A:ALU-A>config>port# info detail
-----
description "DS1/E1"
tdm
    e1
        shutdown
        framing g704
        no loopback
        clock-source node-timed
        no signal-mode
        report-alarm ais los
        no report-alarm oof rai looped ber-sd ber-sf
        no hold-time
        ssm
            shutdown
            ssm-bit 8
            no tx-dus
        channel-group 1
            shutdown
            description "DS0GRP"
            mode network
            encaps-type ppp-auto
            no mtu
            network
                queue-policy "default"
            exit
            timeslots 11-20
            crc 16
            idle-cycle-flag flags
            no scramble
            ppp
                keepalive 10 dropcount 3
            exit
        exit
    exit
    line-impedance 120
exit
no shutdown
-----
*A:ALU-A>config>port#
```

3.11.2.11 Configuring T1 Line Buildout

Telcordia GR-499 requirements indicate that a T1/E1 transmitter will typically support an LBO adjustment in order to maintain an equivalent interconnect distance of approximately 655 ft over the full range of cable lengths up to 655 ft (200 m).

Use the following CLI syntax to configure LBO functions for T1 (DS1) ports. The LBO function is implemented using the length command. To change the length of the port, you must first shut down the port and then configure the length. This command applies to T1 ports only.

CLI Syntax:

```
port port-id
    tdm
        length {133 | 266 | 399 | 533 | 655}
```

The following CLI syntax shows an example of configuring a length of 266 ft on a T1 port.

Example:

```
config# port 1/1/1
config>port# shutdown
config>port# tdm
config>port>tdm# length 266
config>port>tdm# exit
config>port# no shutdown
```

Use the **config port info** command to display port configuration information.

```
ALU-A>config>port# info
#-----
    tdm
        length 266
    ds1
        channel-group 1
        encap-type cem
        timeslots 1-24
        no shutdown
    exit
    no shutdown
    exit
    exit
#-----
```

3.11.2.12 Configuring TDM E1 SSM

Use the following CLI syntax to configure Synchronization Status Messaging (SSM) for E1 TDM ports.



Note: Only **g704** framing mode should be used with E1 SSM. The **no-crc-g704** and **e1-unframed** framing modes are not compatible with E1 SSM.

CLI Syntax:

```

port port-id
    tdm
        e1
            ssm
                [no] shutdown
                [no] ssm-bit sa-bit
                [no] tx-dus

```

The following CLI syntax shows an example of configuring SSM on an E1 port.

Example:

```

config# port 1/3/1
config>port# tdm
config>port>tdm# e1
config>port>tdm>e1# ssm
config>port>tdm>e1>ssm# ssm-bit 4
config>port>tdm>e1>ssm# tx-dus

```

Use the **config port info** command to display port configuration information.

```

ALU-A>config>port# info
#-----
    tdm
        e1
            ssm
                ssm-bit 4
                tx-dus
                no shutdown
            exit
        no shutdown
    exit
exit
#-----

```

3.11.2.13 Configuring ATM Interface Parameters

ATM interface parameters can be configured for SONET/SDH ports in access mode, TDM ports or channels supporting ATM encapsulation, and IMA multilink bundles. The parameters allow users to configure characteristics of an ATM interface. The 7705 SAR-8 and 7705 SAR-18 support configuration of the following ATM interface parameters:

- **cell-format** — allows the user to select the ATM cell format to be used on a given interface: UNI or NNI (NNI is not supported on SONET/SDH interfaces)
- **min-vp-vpi** — allows the user to set the minimum allowable virtual path identifier (VPI) value that can be used on the ATM interface for a VPC
- **mapping** — allows the user to configure ATM cell mapping for DS3 clear channels. Since E3 ports only support G.751 framing with direct cell mapping, ATM mapping is hard-coded for direct mapping for an E3 port (you will get an error message if you try to change the value).

3.11.2.13.1 ATM Interface Commands

Use the following CLI syntax to configure basic ATM interface parameters for SONET/SDH ports.

CLI Syntax:

```

port port-id
    sonet-sdh
        path [sonet-sdh-index]
            atm
                cell-format cell-format
                min-vp-vpi value
```

Use the following CLI syntax to configure basic ATM interface parameters for TDM DS3/E3 ports.

CLI Syntax:

```

port port-id
    tdm
        ds3
            atm
                cell-format cell-format
                mapping direct
                min-vp-vpi value
        e3
            atm
                cell-format cell-format
                min-vp-vpi value
```


Use the following CLI syntax to configure basic ATM interface parameters for TDM DS1/E1 channels.

CLI Syntax:

```
port port-id
  tdm
    ds1
      channel-group 1
      atm
        cell-format cell-format
        min-vp-vpi value
    e1
      channel-group 1
      atm
        cell-format cell-format
        min-vp-vpi value
```

Use the following CLI syntax to configure basic ATM interface parameters for IMA multilink bundles.

CLI Syntax:

```
port>multilink-bundle
  ima
    atm
      cell-format cell-format
      min-vp-vpi value
```

3.11.2.14 Configuring Multilink PPP Bundles

The following cards, modules, and platforms support multilink bundles:

- T1/E1 ports on the 7705 SAR-A (variants with T1/E1 ports)
- T1/E1 ports on the 7705 SAR-M (variants with T1/E1 ports)
- T1/E1 ports on the 7705 SAR-X

The following must have all member links of an MLPPP bundle configured on the same card or module:

- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module (on 7705 SAR-H)

The following must have all member links of an MLPPP bundle configured on the same card or module, and on the same port:

- 2-port OC3/STM1 Channelized Adapter card
- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card

Multilink bundling is based on a link control protocol (LCP) option negotiation that permits a system to indicate to its peer that it is capable of combining multiple physical links into a bundle. Each bundle represents a single connection between two routers. The bundles aggregate channelized ports to define the bandwidth between the routers over the DS1 links.

Multilink bundling operations are modeled after a virtual PPP link-layer entity where packets received over different physical link-layer entities are identified as belonging to a separate PPP network protocol (the Multilink Protocol, or MP) and recombined and sequenced according to information present in a multilink fragmentation header. All packets received over links identified as belonging to the multilink arrangement are presented to the same network-layer protocol processing machine, whether they have multilink headers or not.

When you configure multilink bundles, consider the following guidelines.

- A multilink bundle configuration should include at least 2 ports.
- Multilink bundles can only be aggregated on a single adapter card.
- All member links of an MLPPP group must be of the same type (either E1 or Ds1).
- When you configure a channel group on the network side with ppp-auto encapsulation, the system automatically allocates all timeslots to the channel group.
- When you configure a channel group on the access side with IPCP encapsulation, the system does not automatically allocate all timeslots to the channel group. In order to use the port or channel group as a member in an MLPPP or MC-MLPPP, you must manually allocate all the timeslots to the channel group before adding it to the bundle.

3.11.2.15 Configuring MC-MLPPP

When you configure MC-MLPPP on a port, consider the following guidelines:

- MC-MLPPP can be enabled on every MLPPP bundle
- MC-MLPPP must be enabled before links are added
- links inside an MC-MLPPP bundle must be configured for access mode and IPCP encapsulation type. All links must be from the same adapter card and all timeslots must be allocated to a single channel group.
- a single fragment size for all classes is supported
- prefix elision is not supported, as per RFC 2686. The prefix elision (compressing common header bytes) option advises the router that, in each of the given classes, the implementation expects to receive only packets with a certain prefix; this prefix is not to be sent as part of the information in the fragments of this class.

Use the following CLI syntax to configure MC-MLPPP.

CLI Syntax:

```
config port {bundle-id}
    multilink-bundle
        mlppp
            multiclass count
```

The following CLI syntax shows an example of configuring MC-MLPPP.

Example:

```
config# port bundle-ppp-1/6.1
config>port# multilink-bundle
config>port>multilink-bundle# mlppp
config>port>multilink-bundle>mlppp# multiclass 4
config>port>multilink-bundle>mlppp# exit
config>port>multilink-bundle# exit
config>port# exit
config#
```

Use the **config port info** command to display port configuration information.

```
ALU-B>config>port# info
....
#-----
echo "Port Configuration"
#-----
....
    port bundle-ppp-1/6.1
        shutdown
        multilink-bundle
            mlppp
                multiclass 4
            exit
```

3.11.2.16 Configuring LAG Parameters

Observe the following general rules and conditions when configuring LAGs.

- All ports (links) in a LAG must share the same characteristics (speed, duplex, hold-timer, and so on). The port characteristics are inherited from the primary port.
- Autonegotiation must be disabled or set to limited mode for ports in a LAG, in order to guarantee a specific port speed.
- Ports in a LAG must be configured as full duplex.
- Ports in a LAG must be configured with the same encapsulation value.
- LAG is supported on Ethernet access, network, and hybrid ports.
- On access ports, the links must be distributed over two different adapter cards or different MDAs on the 7705 SAR-X, in order to minimize the effect of an adapter card failure on the LAG.
- On network ports, the links can be on the same platform or adapter card/module or distributed over multiple components.
- A LAG can be in active/active mode or in active/standby mode for access, network, or hybrid mode. Active/standby mode is a subset of active/active mode if subgroups are enabled.
- By default, LACP is disabled. LACP operates in two modes: passive and active. If the mode on the CE end is passive, the LACP mode on the 7705 SAR end must be active.



Note: LACP cannot be configured for static LAG. For more information on static LAG, see [Static LAG \(Active/Standby LAG Operation without LACP\)](#).

- Each link in a LAG must be a member of a subgroup. On access, network or hybrid ports, a LAG can have a maximum of four subgroups and a subgroup can have links up to the maximum number supported on the LAG. LAG is active/active if there is only one sub-group. LAG is active/standby if there is more than one subgroup.
- The port with the highest priority is the primary port. If multiple ports have the same priority, the port with the lowest port ID becomes the primary port.
- A port on standby can be replaced while the active port in the LAG is operational.

- When one port is on a first- or second-generation Ethernet adapter card and the other port is on a third-generation Ethernet adapter card, mix-and-match traffic management occurs. The LAG SAP uses a generic QoS configuration where **scheduler-mode**, *agg-rate*, and *cir-rate* are configured for the SAP, but only those applicable parameters needed by the active adapter card are used to set the QoS values of the active port. See [LAG Support on Mixed-Generation Hardware](#) for details. See [Table 2](#) for a list of adapter card generations.
- The primary port configuration settings are applied to both the primary and secondary LAG ports. Thus in order to support unshaped SAPs when the primary port is a Gen-3-based port and the secondary port is a Gen-2-based port, configuring the **unshaped-sap-cir** on the Gen-3-based port is allowed, even though it does not apply to the Gen-3-based port. This is because **unshaped-sap-cir** is needed by the (secondary) Gen-2-based port when it becomes the active port. The full command is **config>port>ethernet>access>egress>unshaped-sap-cir** *cir-rate*.
- When a LAG contains a port on a first-generation Ethernet adapter card, the scheduler mode can only be 4-priority.

Additional general rules for LAG configuration are as follows.

- Most port features (port commands) can only be configured on the primary member port. The configuration, or any change to the configuration, is automatically propagated to any remaining ports within the same LAG. Operators cannot modify the configurations on non-primary ports.
- When adding the first port member to a LAG group, its port configuration becomes the configuration of the LAG group.
- Once a LAG group has been created, new ports can be added to the LAG group only if their port configurations match with the LAG group configurations inherited from the group's existing primary port. A newly added port may become the primary port or a non-primary port, depending on the setting of the LAG selection criteria, priorities, and so on.
- Not all configurations follow the conventions above. Some exceptions include the commands **loopback** (internal or line), **cfm-loopback**, **mac**, **lldp**, **dot1x**, **efm-oam**, and so on.
- At boot-up, port configuration is applied before LAG configuration is applied. Therefore, configuration values are allowed or prohibited for both a standalone port and a port attached to a LAG group; otherwise, a database **restore** or **exec** command will fail. For example, if the scheduler mode **profile** command option is supported on a Gen-2 port that is the primary member of a LAG, operators are allowed to change **scheduler-mode** on other member links, including Gen-1 and Gen-3 ports. If the scheduler mode **profile** command option is blocked for a standalone Gen-2 port, then after issuing an **admin>save** command followed by a **reboot** command, the node will fail to reload the database file.

The following CLI syntax shows an example of configuring LAG parameters:

Example:

```
config# lag 2
config>lag# description LAG2
config>lag# port 1/4/3 priority 200 sub-group 1
config>lag# port 1/5/3 priority 100 sub-group 2
config>lag# lacp active administrative-key 32768
```

The following example displays a LAG configuration:

```
ALU-B>config>lag# info detail
-----
shutdown
description "LAG2"
port 1/4/3 priority 200 sub-group 1
port 1/5/3 priority 100 sub-group 2
lacp active administrative-key 32768
no mac
mode access
encap-type null
port-threshold 0
lacp-xmit-interval fast
lacp-xmit-stdby
no selection-criteria
no hold-time
standby-signaling lacp
-----
ALU-B>config>lag#
```

3.11.2.17 Configuring Multilink ATM Inverse Multiplexing (IMA) Groups

IMA groups are supported on channelized 16-port T1/E1 ASAP Adapter cards, 32-port T1/E1 ASAP Adapter cards, 2-port OC3/STM1 Channelized Adapter cards, and T1/E1 ports on the 7705 SAR-M (variants with T1/E1 ports). The groups aggregate E1 or DS1 ATM channels into a single logical ATM interface.

3.11.2.17.1 Configuring IMA Groups

Use the following CLI syntax to configure IMA group parameters.

CLI Syntax:

```
configure# port bundle-ima-slot/port.bundle-num
description description-string
multilink-bundle
    ima
        atm
            cell-format {uni|nni}
```

```

        min-vp-vpi vp-vpi-value
    exit
    link-delay {activate | deactivate}
        milliseconds
    version IMA-version
    member port-id
    minimum-links minimum-links
    red-differential-delay red-diff-delay [down]

```

3.11.2.17.2 Configuration Notes for IMA Groups

An IMA group has common interface characteristics (for example, configuration that applies to a logical ATM interface either configured via the IMA group context or taken from the primary link). The following list details the common IMA group interface characteristics:

- ATM interface characteristics (under the ATM menu context)
- interface mode type (only access is supported)

Member links inherit these common characteristics from the IMA group that they are part of and as long as they are part of the IMA group.

The primary link is the member that has the lowest ifindex. When a member is added or deleted, the primary member may be changed based on the ifindexes of all member links.

Once a path becomes part of an IMA group logical link, the path ceases to exist as a physical ATM path interface. This means that:

- ATM interface characteristics enforced over the link are those of a group. When a link is removed from an IMA group, the link's ATM characteristics are reset to ATM interface defaults.
- no services can be configured on the member link itself

After the primary member has been added, each additional member added to the group will only be accepted if it matches the configuration of the IMA group.

ATM interface characteristics are not part of this verification as they are overwritten or reset to defaults when a link is added to or removed from an IMA group.

When a member is assigned to an IMA group, the member is automatically assigned an IMA link ID. IMA link IDs range from 0 to 16 and stay constant as long as the router does not reboot.

When configuring IMA groups, consider the following guidelines.

- All IMA links in an IMA group must belong to the same T1/E1 Adapter card or the same physical OC3 port.
- IMA bundles can only be aggregated on a single adapter card.
- On the 2-port OC3/STM1 Channelized Adapter card, the red differential delay is configurable from 2 to 50 ms and is accurate within 1 ms. On the 16-port T1/E1 ASAP Adapter card and 32-port T1/E1 ASAP Adapter card, the red differential delay is configurable from 2 to 75 ms and is accurate within 1 ms.
- If no member links are configured on an IMA group, the speed of an E1 channel will be used to compute the maximum IMA group bandwidth that may be allocated to shaped services.
- When adding member links to an IMA group, the clock-source of the E1 or DS1 link must be set to node-timed.

The following example illustrates creation of an IMA group with three group members residing on a channelized 16-port T1/E1 ASAP Adapter card in slot 1/3/1:

```
ALU-A>config# port bundle-ima-1/3.1
ALU-A>config>port# multilink-bundle
ALU-A>config>port>ml-bundle# member 1/3/1.1
ALU-A>config>port>ml-bundle# member 1/3/2.1
ALU-A>config>port>ml-bundle# member 1/3/3.1
```

3.11.2.17.3 IMA Test Procedure

Use the following CLI syntax to perform an IMA test pattern procedure on a member link of an IMA group.

CLI Syntax:

```
configure# port bundle-ima-slot/port.bundle-num
multilink-bundle
    ima
    test-pattern-procedure
        test-link port-id
        test-pattern [pattern]
    no shutdown
```

An operator can deploy IMA test procedures to verify operations of an IMA group and its member links. The following is a list of key points about the test pattern procedure.

1. The test procedure is performed as defined by the IMA specification version 1.1. That is, a test pattern is sent over the specified link and is expected to be looped back over all the links in the group. ICP cells are used to perform the test.
2. The test procedure is not traffic-affecting; that is, data traffic will not be affected by the ongoing test.
3. There can only be a single test executed per IMA group at any given time.

4. The IMA member link must exist in the specified group for the command to be accepted.
 5. The test pattern procedure must be shut down before a new test-link value or test pattern is accepted.
 6. The current IMA group test pattern configuration and result of a given IMA test can be seen by executing a show command for the IMA group. A test-link result can have three values:
 - Disabled: the test-link is currently not running
 - Operating: the test pattern procedure is **no shutdown** and there are currently no failed links for this running test-pattern procedure
 - Link-Failed: one or more links have failed the test-pattern procedure. Execute a **show port slot/mda/port ima-link** command to see the failed link and received pattern value.
 7. Deleting a member link that is the same as the specified test-link, to stay in compliance with key point 4, will result in the test-link value being reset to default.
- IMA test procedure configurations are not saved when the admin **save** command is executed.

3.11.2.18 Configuring SDI Ports for IPCP Encapsulation

V.35 and X.21 ports on the 12-port Serial Data Interface card can be configured for IPCP encapsulation to support PPP SAPs for Ipipes. See the 7705 SAR Services Guide for more information about IP interworking VLL (Ipipe) services.

Use the following CLI syntax to configure IPCP parameters for V.35 serial ports. X.21 ports that are configured for super-rate speeds are also supported. The **encap-type** must be set to **ipcp**.

```

CLI Syntax:  port port-id
                  serial
                  v35
                  channel-group channel-group-id
                      encap-type {cem | frame-relay | ipcp
                                | hdlc | cisco-hdlc}
                      mode access
                      ppp
                      keepalive time-interval
                                [dropcount drop count]
                      exit
                  exit
                  no shutdown
                  exit

```

```

        no shutdown
    exit
exit
no shutdown

```

Use the **config port info detail** command to display port configuration information:

```

*A:ALU-A>config>port# info detail
-----
description "RS-232/V.35/X.21"
serial
    v35
        shutdown
        no loopback
        control-lead
        input
            dtr-dsr high
            rts-dcd high
            alb-cts high
        exit
        output
            dsr-dtr high
            dcd-rts high
            cts-alb high
        exit
    exit
    speed 64k
    device-mode synchronous
    device-gender dce
    clock-source slave
    duplex full
    no report-alarm hcmOof hcmRai
    channel-group 1
        shutdown
        description "DS0GRP"
        mode access
        encap-type ipcp
        mtu 2000
        crc 32
        idle-cycle-flag ones
        ppp
            keepalive 20 dropcount 100
        exit
    exit
exit
exit
-----
*A:ALU-A>config>port#

```

3.11.2.19 Configuring TDM and SDI Ports for Frame Relay Encapsulation

Frame relay service can be configured on the following ports:

- 16-port T1/E1 ASAP Adapter card, version 2, on DS1 or E1 ports
- 32-port T1/E1 ASAP Adapter card on DS1 or E1 ports
- 4-port DS3/E3 Adapter card on clear channel DS3 or E3 ports, or on DS3 ports channelized to DS1 or E1 down to DS0
- 12-port Serial Data Interface card on V.35 and X.21 ports

Frame relay ports can be configured in access mode to support:

- Fpipes on:
 - 16-port T1/E1 ASAP Adapter card, version 2, on DS1 or E1 ports
 - 32-port T1/E1 ASAP Adapter card on DS1 or E1 ports
 - 4-port DS3/E3 Adapter card on clear channel DS3 or E3 ports, or on DS3 ports channelized to DS1 or E1 down to DS0
 - 12-port Serial Data Interface card on V.35 or X.21 ports
- Ipipes on:
 - 16-port T1/E1 ASAP Adapter card, version 2, on DS1 or E1 ports
 - 32-port T1/E1 ASAP Adapter card on DS1 or E1 ports
 - 4-port DS3/E3 Adapter card on clear channel DS3 or E3 ports only
 - 12-port Serial Data Interface card on V.35 or X.21 ports

The **encap-type** must be set to **frame-relay**. The settings for the frame relay port can be modified by using the parameters under the **frame-relay** command hierarchy as shown in the following examples. The settings apply to frame relay ports used for Fpipe SAPs and interworking Ipipe SAPs. See the 7705 SAR Services Guide for more information about frame relay VLL (Fpipe) services and IP interworking VLL (Ipipe) services.

Use the following CLI syntax to configure a frame relay access port on a 16-port T1/E1 ASAP Adapter card or a 32-port T1/E1 ASAP Adapter card.

CLI Syntax:

```
port port-id
    tdm
        e1
            channel-group channel-group-id
```

```

encap-type
    {atm|bcpl-null|bcpl-dot1q|ipcp|
    ppp-auto|frame-relay|wan-mirror
    |cisco-hdlc|cem|hdlc}
frame-relay
    lmi-type {ansi | itu | none |
    rev1}
    mode {dce | dte | bidir}
    n393dce count
    n393dte count
    n391dte intervals
    n392dce threshold
    n392dte threshold
    t391dte keepalive
    t392dce keepalive
mode access
no shutdown
exit
no shutdown
exit
exit
no shutdown

```

Use the **config port info detail** command to display port configuration information:

```

*A:ALU-A>config>port# info detail
-----
description "DS1/E1"
tdm
    e1
        shutdown
        framing g704
        no loopback
        clock-source node-timed
        no signal-mode
        report-alarm ais los
        no report-alarm oof rai looped ber-sd ber-sf
        no hold-time
        ssm
            shutdown
            ssm-bit 8
            no tx-dus
        channel-group 1
            shutdown
            description "E1"
            mode access
            encap-type frame-relay
            no mtu
            network
                queue-policy "default"
            exit
            timeslots 2-32
            crc 16
            frame-relay

```

```

        lmi-type ansi
        mode dte
        n393dce 4
        n393dte 4
        n391dte 6
        n392dce 3
        n392dte 3
        t391dte 10
        t392dce 15
    exit
exit
    exit
    line-impedance 120
exit
no shutdown
-----
*A:ALU-A>config>port#

```

Use the following CLI syntax to configure frame relay parameters for TDM DS3/E3 ports.

CLI Syntax:

```

port port-id
    tdm
        ds3
            encap-type {atm | bcp-null | bcp-dot1q |
                ipcp | ppp-auto | frame-relay |
                wan-mirror | cem}
            mode {access | network}
            frame-relay
                lmi-type {ansi | itu | none | rev1}
                mode {dce | dte | bidir}
                n393dce count
                n393dte count
                n391dte intervals
                n392dce threshold
                n392dte threshold
                t391dte keepalive
                t392dce keepalive
            no shutdown
        exit
    no shutdown
exit
exit
no shutdown
    e3
        encap-type {atm | bcp-null | bcp-dot1q |
            ipcp | ppp-auto | frame-relay |
            wan-mirror | cem}
        mode {access | network}
        frame-relay
            lmi-type {ansi | itu | none | rev1}
            mode {dce | dte | bidir}

```

```

n393dce count
n393dte count
n391dte intervals
n392dce threshold
n392dte threshold
t391dte keepalive
t392dce keepalive
no shutdown
exit
no shutdown
exit
exit
no shutdown

```

Use the following CLI syntax to configure frame relay parameters for V.35 serial ports. X.21 ports at super-rate speeds are also supported.

CLI Syntax:

```

port port-id
  serial
    v35
      channel-group channel-group-id
      encaps-type {cem | frame-relay | ipcp |
        hdlc | cisco-hdlc}
      mode access
      frame-relay
        lmi-type {ansi | itu | none | rev1}
        mode {dce | dte | bidir}
        n393dce count
        n393dte count
        n391dte intervals
        n392dce threshold
        n392dte threshold
        t391dte keepalive
        t392dce keepalive
      no shutdown
    exit
  no shutdown
exit
exit
no shutdown

```

3.11.2.20 Configuring TDM and SDI Ports for HDLC Encapsulation

HDLC service can be configured on the following ports:

- 16-port T1/E1 ASAP Adapter card, version 2, on clear channel or fractional DS1 or E1 ports
- 32-port T1/E1 ASAP Adapter card on clear channel or fractional DS1 or E1 ports
- 12-port Serial Data Interface card on V.35 serial ports and X.21 serial ports (at super-rate speeds only)

HDLC ports can be configured in access mode to support Hpipes on the above cards. The **encap-type** must be set to **hdlc**.



Note: HDLC encapsulation can be used on a port to transmit cHDLC frames into an Hpipe.

Use the following CLI syntax to configure a T1/E1 port for HDLC.

HDLC ports cannot be configured if the mode is set to network.

CLI Syntax:

```

port port-id
    tdm
        e1
            channel-group channel-group-id
                encap-type {atm | cem | ipcp |
                    ppp-auto | frame-relay | hdlc |
                    cisco-hdlc}
                timeslots timeslots
                mode {access}
                no shutdown
            exit
        no shutdown
    exit
exit
no shutdown

```

Use the **config port info** command to display the new port configuration information:

```

*A:ALU-A>config>port# info detail
-----
description "DS1/E1"
tdm
    e1
        shutdown
        framing g704
        no loopback

```

```

        clock-source node-timed
        no signal-mode
        report-alarm ais los
        no report-alarm oof rai looped ber-sd ber-sf
        no hold-time
        ssm
            shutdown
            ssm-bit 8
            no tx-dus
        channel-group 1
            description "DS0GRP"
            mode access
            encap-type hdlc
            no mtu
            timeslots 2-32
            crc 16
            idle-cycle-flag flags
            no scramble
            no shutdown
        exit
        no shutdown
    exit
    line-impedance 120
exit
no shutdown
-----
*A:ALU-A>config>port#

```

Use the following CLI syntax to configure an X.21 serial port (super-rate speed) on a 12-port Serial Data Interface card for HDLC. The syntax for a V.35 serial port is similar.

CLI Syntax:

```

port port-id
    serial
        x21
            channel-group channel-group-id
                encap-type {cem | ipcp | frame-relay
                    | hdlc | cisco-hdlc}
                mode access
            no shutdown
            speed
                {1200|2400|4800|9600|19200|38400|56000
                |64k|128k|256k|384k|512k|640k|768k|89k
                |1024k|1152k|1280k|1408k|1536k|1664k
                |1792k|1920k}
            exit
            no shutdown
        exit
    exit
no shutdown

```

Use the **config port info** command to display the new port configuration information:

```
*A:ALU-A>config>port# info
-----
description "RS-232/V.35/X.21"
serial
  x21
    speed 1024k
    channel-group 1
    shutdown
    encap-type hdlc
    mode access
  exit
  no shutdown
exit
exit
no shutdown
-----
*A:ALU-A>config>port#
```

3.11.2.21 Configuring TDM and SDI Ports for Cisco HDLC Encapsulation

Cisco HDLC (cHDLC) service can be configured on the following ports:

- 16-port T1/E1 ASAP Adapter card, version 2, on clear channel or fractional DS1 or E1 ports
- 32-port T1/E1 ASAP Adapter card on clear channel or fractional DS1 or E1 ports
- 12-port Serial Data Interface card on V.35 serial ports and X.21 serial ports (at super-rate speeds)

Cisco HDLC ports can be configured in access mode to support lpipes on the above cards. The **encap-type** must be set to **cisco-hdlc**.



Note: Cisco HDLC encapsulation cannot be used to transmit HDLC frames into an lpipe.

Use the following CLI syntax to configure a T1/E1 port for cHDLC.

Cisco HDLC ports cannot be configured if the mode is set to network.

CLI Syntax:

```

port port-id
    tdm
        e1
            channel-group channel-group-id
                encap-type {atm | cem | ipcp |
                    ppp-auto | frame-relay | hdlc |
                    cisco-hdlc}
                cisco-hdlc
                    down-count down-count
                    keep-alive time-interval
                    up-count up-count
                    timeslots timeslots
                    mode {access | network}
                    no shutdown
            exit
        no shutdown
    exit
exit
no shutdown

```

Use the **config port info** command to display the new port configuration information:

```
*A:ALU-A>config>port# info detail
-----
      description "DS1/E1"
      tdm
        e1
          shutdown
          framing g704
          no loopback
          clock-source node-timed
          no signal-mode
          report-alarm ais los
          no report-alarm oof rai looped ber-sd ber-sf
          no hold-time
          ssm
            shutdown
            ssm-bit 8
            no tx-dus
          channel-group 1
            description "DS0GRP"
            mode access
            encap-type cisco-hdlc
            no mtu
            timeslots 2-32
            crc 16
            idle-cycle-flag flags
            no scramble
            cisco-hdlc
              keepalive 0
              upcount 1
              downcount 3
            exit
          no shutdown
        exit
      no shutdown
    exit
  line-impedance 120
exit
no shutdown
-----
*A:ALU-A>config>port#
```

Use the following CLI syntax to configure an X.21 serial port (at super-rate speeds) on a 12-port Serial Data Interface card for cHDLc. The syntax for a V.35 serial port is similar.

CLI Syntax:

```
port port-id
  serial
    x21
      channel-group channel-group-id
        encap-type {cem | ipcp | frame-relay
          | hdlc | cisco-hdlc}
        mode access
      no shutdown
```

```

                                speed
                                {1200|2400|4800|9600|19200|38400|56000
                                |64k|128k|256k|384k|512k|640k|768k|89k
                                |1024k|1152k|1280k|1408k|1536k|1664k
                                |1792k|1920k}
                                no shutdown
                                exit
                                no shutdown
                                exit
                                exit
                                no shutdown

```

Use the **config port info** command to display the new port configuration information:

```

*A:ALU-A>config>port# info
-----
description "RS-232/V.35/X.21"
serial
  x21
    speed 1024k
    channel-group 1
    shutdown
    description "DS0GRP"
    mode access
    encap-type cisco-hdlc
    cisco-hdlc
    keepalive 10
    up-count 1
    down-count 3
    exit
  exit
  no shutdown
exit
exit
no shutdown
-----
*A:ALU-A>config>port#

```

3.11.2.22 Configuring GNSS Receiver Port Parameters

Use the following CLI syntax to configure GNSS receiver port parameters.

```

CLI Syntax:  config# port port-id
                  gnss
                    antenna-cable-delay 0..32767
                    no antenna-cable-delay
                    elevation-mask-angle 0..89
                    no elevation-mask-angle
                    [no] type [gps] [glonass]

```

3.11.2.23 Configuring Serial Ports for Raw Socket Transport

Use the following CLI syntax to configure raw socket parameters on an RS-232 serial port.



Note: Raw sockets are only supported on RS-232 serial ports.

CLI Syntax:

```

port port-id
  serial
    rs232
      socket socket-id
        description description-string
        encap-type raw
        rx
          eop
            idle-timeout milliseconds
            length bytes
            special-char value
            exit
          unsquelch-delay seconds
          squelch-reset
          exit
        tx
          inter-session-delay
            milliseconds
          exit
        no shutdown
      exit
    exit
  exit

```

3.11.3 Configuring SCADA Bridge Parameters

Use the following CLI commands to configure SCADA bridge parameters on an Integrated Services card.

CLI Syntax:

```

scada bridge-id
  branch branch-id
    description description-string
    gain
      input decibels
      output decibels

```

```

        squelch
        exit
    description description-string
    exit
    mddb
        force-active master branch-id
        redundant-mode redundant-mode
        report-alarm [hcmOof] [hcmRai]
        speed {600 | 1200 | 2400 | 4800 | 9600 | 19200
              | 38400 | 56000}
        squelch timeout timeout
        squelch reset
        squelch-recovery [mode] [time time]
        exit
    pcm
        force-active master branch-id
        redundant-mode redundant-mode
        squelch reset
        squelch timeout timeout
        squelch-recovery [mode] [time time]
        exit
    vcb
        idle-code abcd-code
        seized-code abcd-code
        exit
    exit

```

The following CLI syntax shows an example of configuring SCADA bridge parameters on an Integrated Services card.

CLI Syntax:

```

scada 1/8/1 type mddb
    description "scada bridge1"
    no shutdown
    branch 1
        no shutdown
        exit
    branch 2
        no shutdown
        exit
    branch 3
        no shutdown
        exit
    branch 4
        no shutdown
        exit
    branch 5
        no shutdown
        exit
    branch 6

```

```

        no shutdown
        exit
    branch 7
        no shutdown
        exit
    branch 8
        no shutdown
        exit
    branch 9
        no shutdown
        exit
    branch 10
        no shutdown
        exit
    branch 11
        no shutdown
        exit
    branch 12
        no shutdown
        exit
    exit
    mddb
        report-alarm hcmOof hcmRai
        squelch timeout 60
        exit
    exit
exit

```

Use the **config scada info** command to display the new SCADA bridge configuration information:

```

ALU-1>config>scada# info
#-----
echo "MDDB Configuration"
#-----
.....
    scada 1/8/1
        description "scada bridge1"
        mddb
            squelch timeout 60
        exit
        branch 1
            no shutdown
        exit
        branch 2
            no shutdown
        exit
        branch 3
            no shutdown
        exit
        branch 4
            no shutdown
        exit

```

```
    branch 5
      no shutdown
    exit
  branch 6
    no shutdown
  exit
  branch 7
    no shutdown
  exit
  branch 8
    no shutdown
  exit
  branch 9
    no shutdown
  exit
  branch 10
    no shutdown
  exit
  branch 11
    no shutdown
  exit
  branch 12
    no shutdown
  exit
exit
.....
```


3.12 Service Management Tasks

This section describes the following service management tasks:

- [Changing a Provisioned Adapter Card Type](#)
- [Deleting an Adapter Card](#)

3.12.1 Changing a Provisioned Adapter Card Type

To change an adapter card type already provisioned for a specific slot, you must shut down any existing port configurations on the card, delete the adapter card configuration, and provision the new adapter card.

Use the following CLI syntax to change an adapter card type:

CLI Syntax:

```
port port-id
shutdown
exit
```

CLI Syntax:

```
card slot-number //always 1
mda mda-number
shutdown
exit
no mda mda-number //deletes the adapter card
mda mda-number
mda-type mda-type //provisions new adapter card
no shutdown
```

The following CLI syntax shows an example of modifying an adapter card.

Example:

```
config# port 1/1/1
config>port# shutdown
config>port# exit
config# port 1/1/2
config>port# shutdown
config>port# exit
config# card 1
config>card# mda 1
config>card>mda# shutdown
config>card>mda# exit
config>card# no mda 1
config>card# mda 1
config>card>mda# mda-type a16-chds1
config>card>mda# no shutdown
```

3.12.2 Deleting an Adapter Card

To delete an adapter card provisioned for a specific slot, you must shut down any existing port configurations on the card and delete the adapter card configuration.

Use the following CLI syntax to delete an adapter card provisioned for a specific slot.

CLI Syntax: `port port-id`
 `shutdown`
 `exit`

CLI Syntax: `card slot-number //always 1`
 `mda mda-number`
 `shutdown`
 `exit`
 `no mda mda-number //deletes the adapter card`
 `exit`

The following CLI syntax shows an example of deleting an adapter card.

Example: `config# port 1/1/1`
 `config>port# shutdown`
 `config>port# exit`
 `config# port 1/1/2`
 `config>port# shutdown`
 `config>port# exit`
 `config# card 1`
 `config>card# mda 1`
 `config>card>mda# shutdown`
 `config>card>mda# exit`
 `config>card# no mda 1`
 `config>card# exit`

3.13 Configuration Command Reference

3.13.1 Command Hierarchies

- [Card Commands](#)
- [Adapter Card Commands](#)
- [External Alarm Commands](#)
- [APS Port Commands](#)
- [Microwave Link Commands](#)
- [Port Configuration Commands](#)
- [Ethernet Commands](#)
- [DSL Commands](#)
- [GPON Commands](#)
- [GNSS Commands](#)
- [IEEE 802.1x Ethernet Port Commands](#)
- [LLDP Ethernet Port Commands](#)
- [Ring Virtual Port Ethernet Commands](#)
- [Ring MAC Operations Commands](#)
- [Multilink Bundle and IMA Group Commands](#)
- [Serial Commands](#)
- [SONET/SDH Commands](#)
- [TDM Commands](#)
- [DS1 Commands](#)
- [DS3 Commands](#)
- [E1 Commands](#)
- [E3 Commands](#)
- [Voice Commands](#)
- [LAG Commands](#)
- [SCADA Commands](#)

3.13.1.1 Card Commands

```

config
  — [no] card slot-number
    — card-type card-type
    — no card-type
    — [no] shutdown

```

3.13.1.2 Adapter Card Commands

```

config
  — [no] card slot-number
    — [no] mda mda-slot
      — access
        — ingress
          — fabric-policy fabric-policy-id
          — no fabric-policy
          — security-queue-policy policy-id
          — no security-queue-policy
          — shaper-policy policy-name
          — no shaper-policy policy-name
        — ais-propagation {enable | disable}
        — clock-mode adaptive
        — clock-mode {dcr-acr | differential} [timestamp-freq {19440 | 25000 | 77760 | 103680}]
        — [no] fabric-stats-enabled
        — mda-mode mda-mode
        — no mda-mode
        — mda-type mda-type
        — no mda-type
        — network
          — ingress
            — fabric-policy fabric-policy-id
            — no fabric-policy
            — queue-policy name
            — no queue-policy
            — security-queue-policy policy-id
            — no security-queue-policy
          — ring
            — add-drop-port-queue-policy name
            — no add-drop-port-queue-policy
            — qos-policy network-policy-id
            — no qos-policy
        — poe-power-source {internal | external | none}
        — no poe-power-source
        — ring (see Ring MAC Operations Commands)
        — [no] shutdown
      — spt
        — security-aggregate-rate agg-rate
        — no security-aggregate-rate

```

- **vcb**
 - **application** {broadcast | teleprotection | vcb | vcb-branch-initiate}
- **voice**
 - **companding-law** {a-law | mu-law}
 - **signaling-type** {type-i | type-ii | type-v}

3.13.1.3 External Alarm Commands

```

config
— external-alarms
  — [no] alarm alarm-id
    — [no] chassis-alarms
    — description description-string
    — no description
    — [no] log
    — severity {critical | major | minor | warning}
    — [no] shutdown
    — thresholds
      — analog
        — [no] level {lt | gt} millivolts
    — trigger [any | all] {alarm-input1 | alarm-input2... | alarm-input8}
    — no trigger
  — input alarm-input
    — debounce seconds
    — debounce detect-seconds clear clear-seconds
    — no debounce
    — description description-string
    — no description
    — name name-string
    — no name
    — normally {open | closed}
    — [no] shutdown
  — output alarm-output
    — description description-string
    — no description
    — name name-string
    — no name
    — [no] shutdown

```

3.13.1.4 APS Port Commands

```

config
— [no] port {aps-id}
    — aps
        — advertise-interval advertise-interval
        — no advertise-interval
        — hold-time hold-time
        — no hold-time
        — hold-time-aps ([signal-fail sf-time] [signal-degrade sd-time])
        — no hold-time-aps
        — neighbor ip-address
        — no neighbor
        — protect-circuit port-id
        — no protect-circuit
        — [no] rdi-alarms {suppress | circuit}
        — revert-time minutes
        — no revert-time
        — switching-mode {bi-directional | uni-1plus1}
        — working-circuit port-id
        — no working-circuit

```



Note: Queue policies for APS are under the APS port hierarchy (port aps-id/sonet-sdh/path/network/queue-policy name), rather than under the physical port, similar to the configuration of regular SONET/SDH ports. See the [SONET/SDH Commands](#) hierarchy for more information.

3.13.1.5 Microwave Link Commands

```

config
— [no] port mw-link-id
    — [no] shutdown
    — mw
        — [no] hold-time {[up hold-time-up] [down hold-time-down]}
        — [no] peer-discovery
        — [no] protection
        — radio port-id create [main | spare]
        — no radio port-id
            — [no] database filename
            — [no] name name-string
            — rsl-history file-url
            — no rsl-history
            — [no] standalone
            — suppress-faults [hber] [rsl-threshold] [rdi] [all]
            — [no] suppress-faults
            — [no] tx-mute
        — [no] revert [eps] [rps]

```

3.13.1.6 Port Configuration Commands

```

config
— port {port-id | bundle-id}
— no port {port-id | bundle-id}
— aps
— [no] ddm-events
— description description-string
— no description
— dsl
— dwdm
— channel channel
— ethernet
— gpon
— multilink-bundle
— serial
— [no] shutdown
— sonet-sdh
— tdm
— voice

```

3.13.1.7 Ethernet Commands

```

config
— [no] port port-id
— ethernet
— access
— egress
— shaper-policy name
— no shaper-policy
— unshaped-sap-cir cir-rate
— no unshaped-sap-cir
— autonegotiate [limited]
— no autonegotiate
— cfm-loopback priority {low | high | dot1p} [match-vlan {vlan-range | none}]
— no cfm-loopback
— crc-monitor
— sd-threshold threshold [multiplier multiplier]
— no sd-threshold
— sf-threshold threshold [multiplier multiplier]
— no sf-threshold
— window-size seconds
— no window-size
— dot1q-etype 0x0600 to 0xffff
— no dot1q-etype
— dot1x
— down-when-looped
— keep-alive timer
— no keep-alive
— retry-timeout timer

```

```

— no retry-timeout
— [no] shutdown
— [no] use-broadcast-address
— duplex {full | half}
— efm-oam
— [no] accept-remote-loopback
— hold-time time-value
— no hold-time
— mode {active | passive}
— [no] shutdown
— [no] transmit-interval interval [multiplier multiplier]
— [no] tunneling
— egress-rate sub-rate [include-fcs] [allow-eth-bn-rate-changes] [hold-time
  hold-time]
— no egress-rate
— encap-type {dot1q | null | qinq}
— no encap-type
— [no] group-encryption
— encryption-keygroup keygroup-id direction {inbound | outbound}
— no encryption-keygroup direction {inbound | outbound}
— hold-time {[up hold-time-up] [down hold-time-down]}
— no hold-time
— ingress-rate ingress-rate cbs {size [bytes | kilobytes] | default}
— no ingress-rate
— src-pause
— no src-pause
— lacp-tunnel
— no lacp-tunnel
— lldp
— loopback {line | internal} {timer {0 | 30 .. 86400} | persistent} [swap-src-dst-
  mac]
— no loopback
— mac ieee-address
— no mac
— mode {access | network | hybrid}
— no mode
— mtu mtu-bytes
— no mtu
— network
— accounting-policy policy-id
— [no] accounting-policy
— [no] collect-stats
— egress
— shaper-policy name
— no shaper-policy
— unshaped-if-cir cir-rate
— no unshaped-if-cir
— queue-policy name
— no queue-policy
— scheduler-mode {profile | 4-priority | 16-priority} (See Note below)
— phy-tx-clock {auto-pref-master | auto-pref-slave | slave | master}
— no phy-tx-clock
— poe [plus]
— no poe

```


- **ptp-asymmetry** *ptp-asymmetry*
- **no ptp-asymmetry**
- **qinq-etype** *0x0600 to 0xffff*
- **report-alarm** [**signal-fail**] [**remote**] [**local**] [**no-frame-lock**] [**high-ber**]
- **no report-alarm**
- **speed** {**10** | **100** | **1000** | **10000**}
- **ssm**
 - **code-type** {**sonet** | **sdh**}
 - [**no**] **shutdown**
 - [**no**] **tx-dus**
- [**no**] **vlan-filter** *filter-id*
- **xgig** {**lan** | **wan**}
- **xor-mode** {**rj45** | **rjp5** | **sfp**}



Note: For more information about how to configure the scheduler mode on Ethernet ports, refer to the 7705 SAR Quality of Service Guide.

3.13.1.8 DSL Commands

- ```

config
 — [no] port port-id
 — dsl
 — adsl2plus {g992-5-a | g992-5-b}

```
- **no adsl2plus**
  - **atm-pvc** *dsl-bonding-vpi dsl-bonding-vci*
  - **no atm-pvc**
  - **cfm-loopback** **priority** {**low** | **high**}
  - **no cfm-loopback**
  - **dot1q-etype** *0x0600 to 0xffff*
  - **no dot1q-etype**
  - **down-when-looped**
    - **keep-alive** *timer*
    - [**no**] **keep-alive**
    - **retry-timeout** *timer*
    - [**no**] **retry-timeout**
    - [**no**] **shutdown**
    - [**no**] **use-broadcast-address**
  - **efm-oam**
    - [**no**] **accept-remote-loopback**
    - **hold-time** *time-value*
    - **no hold-time**
    - **mode** {**active** | **passive**}
    - [**no**] **shutdown**
    - [**no**] **transmit-interval** *interval* [**multiplier** *multiplier*]
    - [**no**] **tunneling**
  - **egress-rate** *sub-rate*
  - **no egress-rate**
  - **encap-type** {**dot1q** | **null** | **qinq**}

---

```

— no encap-type
— hold-time {[up hold-time-up] [down hold-time-down]}
— lacp-tunnel
— no lacp-tunnel
— line number
 — [no] shutdown
— loopback {internal} {timer {0 | 30 .. 86400}}
— no loopback
— mac ieee-address
— no mac
— mode {access | network}
— no mode
— mtu mtu-bytes
— no mtu
— network
 — accounting-policy policy-id
 — no accounting-policy
 — [no] collect-stats
 — queue-policy name
 — no queue-policy
— qinq-etype 0x0600 to 0xffff
— ssm
 — code-type {sonet | sdh}
 — [no] shutdown

```

### 3.13.1.9 GPON Commands

```

config
— [no] port port-id
 — gpon
 — cfm-loopback priority {low | high}
 — no cfm-loopback
 — dot1q-etype 0x0600 to 0xffff
 — no dot1q-etype
 — down-when-looped
 — keep-alive timer
 — [no] keep-alive
 — retry-timeout timer
 — [no] retry-timeout
 — [no] shutdown
 — [no] use-broadcast-address
 — egress-rate sub-rate
 — no egress-rate
 — encap-type {dot1q | null}
 — no encap-type
 — lacp-tunnel
 — no lacp-tunnel
 — loopback {line | internal} {timer {0 | 30 .. 86400}}
 — no loopback
 — mac ieee-address
 — no mac

```

- **mode** {access | network}
- **no mode**
- **mtu** *mtu-bytes*
- **no mtu**
- **network**
  - **accounting-policy** *policy-id*
  - **no accounting-policy**
  - [no] **collect-stats**
  - **queue-policy** *name*
  - **no queue-policy**
- **slid** {alphanumeric | hex} *slid*
- **no slid**

### 3.13.1.10 GNSS Commands

- ```
config
  — port port-id
    — gnss
      — antenna-cable-delay 0 .. 32767
      — no antenna-cable-delay
      — elevation-mask-angle 0 .. 89
      — no elevation-mask-angle
      — [no] type [gps] [glonass]
```

3.13.1.11 IEEE 802.1x Ethernet Port Commands

- ```
config
 — port port-id
 — ethernet
 — dot1x
 — [no] mac-auth
 — mac-auth-wait seconds
 — no mac-auth-wait
 — max-auth-req max-auth-request
 — no max-auth-req
 — port-control {auto | force-auth | force-unauth}
 — no port-control
 — quiet-period seconds
 — no quiet-period
 — radius-plcy name
 — no radius-plcy
 — re-auth-period seconds
 — no re-auth-period
 — [no] re-authentication
 — server-timeout seconds
 — no server-timeout
 — supplicant-timeout seconds
 — no supplicant-timeout
```

- **transmit-period** *seconds*
- **no transmit-period**

### 3.13.1.12 LLDP Ethernet Port Commands

```

config
 — port port-id
 — ethernet
 — lldp
 — dest-mac {nearest-bridge | nearest-non-tpmr | nearest-customer}
 — admin-status {rx | tx | tx-rx | disabled}
 — [no] notification
 — tx-mgmt-address [system]
 — no tx-mgmt-address
 — tx-tlvs [port-desc] [sys-name] [sys-desc] [sys-cap]
 — no tx-tlvs

```

### 3.13.1.13 Ring Virtual Port Ethernet Commands

```

config
 — [no] port port-id
 — ethernet
 — cfm-loopback priority {low | high | dot1p} [match-vlan {vlan-range | none}]
 — no cfm-loopback
 — dot1q-etype 0x0600 to 0xffff
 — no dot1q-etype
 — down-when-looped
 — keep-alive timer
 — no keep-alive
 — retry-timeout timer
 — no retry-timeout
 — [no] shutdown
 — [no] use-broadcast-address
 — duplex full
 — egress-rate sub-rate
 — no egress-rate
 — encap-type {dot1q | null}
 — no encap-type
 — mac ieee-address
 — no mac
 — mode network
 — no mode
 — mtu mtu-bytes
 — no mtu
 — network
 — queue-policy name
 — no queue-policy
 — scheduler-mode 16-priority

```

---

— **speed** 2500

### 3.13.1.14 Ring MAC Operations Commands

```

config
 — card
 — mda mda-id
 — ring
 — [no] disable-aging
 — [no] disable-learning
 — [no] discard-unknown-source
 — fdb-table-high-wmark high-water-mark
 — no fdb-table-high-wmark
 — fdb-table-size table-size
 — no fdb-table-size
 — [no] mac-pinning [port port-id]
 — remote-age aging-timer
 — no remote-age
 — [no] static-mac mac ieee-address port port-id [create]

```

### 3.13.1.15 Multilink Bundle and IMA Group Commands

```

config
 — [no] port {bundle-id}
 — multilink-bundle
 — fragment-threshold fragment-threshold
 — no fragment-threshold
 — ima
 — atm
 — cell-format cell-format
 — min-vp-vpi value
 — link-delay {activate | deactivate} milliseconds
 — no link-delay {activate | deactivate}
 — test-pattern-procedure
 — [no] shutdown
 — test-link port-id
 — no test-link
 — test-pattern pattern
 — no test-pattern
 — version IMA-version
 — no version
 — [no] member port-id
 — minimum-links minimum-links
 — no minimum-links
 — mlppp
 — endpoint-discriminator class {ip-address | global-mac-address | null} [discriminator-id discriminator-id]
 — no endpoint-discriminator

```

- [no] **magic-number**
- **multiclass** *count*
- **no multiclass**
- **mrru** *mrru*
- **no mrru**
- **red-differential-delay** *red-diff-delay* [**down**]
- **no red-differential-delay**
- [no] **short-sequence**
- **yellow-differential-delay** *yellow-diff-delay*
- **no yellow-differential-delay**

### 3.13.1.16 Serial Commands

- ```
config
  — [no] port {port-id}
    — serial
      — [no] rs232
        — [no] channel-group channel-group-id
          — crc {16 | 32}
          — description description-string
          — no description
          — encap-type cem
          — no encap-type
          — idle-payload-fill {all-ones | pattern pattern}
          — no idle-payload-fill
          — mode access
          — [no] shutdown
        — character-length {6 | 7 | 8}
        — clock-source slave
        — control-lead {input | output}
          — input
            — alb-cts {high | low | end-to-end}
            — dtr-dsr {high | low}
            — rdl-ri {high | low}
            — rts-dcd {high | low | end-to-end}
          — monitor
            — alb-cts {on | off}
            — dtr-dsr {on | off}
            — rdl-ri {on | off}
            — rts-dcd {on | off}
          — output
            — cts-alb {high | low | end-to-end}
            — dcd-rts {high | low | end-to-end}
            — dsr-dtr {high | low}
            — ri-rdl {high | low}
        — data-position {F0-B5 | F0-B6}
        — device-gender {dte | dce}
        — device-mode {synchronous | asynchronous}
        — duplex {half | full}
        — hold-time {[up hold-time-up] [down hold-time-down]}
        — no hold-time
```

```

— loopback {bidir-b | bidir-e}
— no loopback
— multi-drop {disabled | slave | master}
— parity {odd | even | mark | space}
— no parity
— [no] report-alarm [hcmOof | hcmRai]
— s-bit-signaling {on | off}
— [no] shutdown
— socket socket-id
    — description description-string
    — no description
    — encap-type encap-type
    — rx
        — eop
            — idle-timeout milliseconds
            — length bytes
            — special-char value
            — no special-char
        — squench-delay seconds
        — no squench-delay
        — squench-reset
        — unsquench-delay seconds
        — no unsquench-delay
— [no] shutdown
    — tx
        — inter-session-delay milliseconds
— speed {600 | 1200 | 2400 | 4800 | 9600 | 19200 | 38400 | 56000 |
57600 | 115200}
— stop-bits {1 | 2}
— [no] v35
    — [no] channel-group channel-group-id
        — cisco-hdlc
            — down-count down-count
            — no down-count
            — keepalive time-interval
            — no keepalive
            — up-count up-count
            — no up-count
        — crc {16 | 32}
        — description description-string
        — no description
        — encap-type {cem | ipcp | frame-relay | hdlc | cisco-hdlc}
        — no encap-type
        — frame-relay
            — lmi-type {ansi | itu | none | rev1}
            — mode {dce | dte | bidir}
            — n391dte intervals
            — no n391dte
            — n392dce threshold
            — no n392dce
            — n392dte threshold
            — no n392dte
            — n393dce count
            — no n393dce

```

```

— n393dte count
— no n393dte
— t391dte keepalive
— no t391dte
— t392dce keepalive
— no t392dce
— idle-cycle-flag {flags | ones}
— no idle-cycle-flag
— idle-payload-fill {all-ones | pattern pattern}
— no idle-payload-fill
— mode access
— mtu mtu-bytes
— no mtu
— [no] ppp
— keepalive time-interval [dropcount drop-count]
— [no] shutdown
— clock-source slave
— control-lead {input | output}
— input
— alb-cts {high | low | end-to-end}
— dtr-dsr {high | low}
— rts-dcd {high | low | end-to-end}
— monitor
— alb-cts {on | off}
— dtr-dsr {on | off}
— rts-dcd {on | off}
— output
— cts-alb {high | low | end-to-end}
— dcd-rts {high | low | end-to-end}
— dsr-dtr {high | low}
— device-gender {dte | dce}
— device-mode {synchronous}
— duplex {half | full}
— hold-time {[up hold-time-up] [down hold-time-down]}
— no hold-time
— loopback {bidir-b | bidir-e}
— no loopback
— [no] shutdown
— speed {64k | 128k | 256k | 384k | 512k | 640k | 768k | 896k | 1024k |
1152k | 1280k | 1408k | 1536k | 1664k | 1792k | 1920k}
— [no] x21
— [no] channel-group channel-group-id
— cisco-hdlc
— down-count down-count
— no down-count
— keepalive time-interval
— no keepalive
— up-count up-count
— no up-count
— crc {16 | 32}
— description description-string
— no description
— encap-type {cem | ipcp | frame-relay | hdlc | cisco-hdlc}
— no encap-type

```


-
- **frame-relay**
 - **lmi-type** {ansi | itu | none | rev1}
 - **mode** {dce | dte | bidir}
 - **n391dte** *intervals*
 - **no n391dte**
 - **n392dce** *threshold*
 - **no n392dce**
 - **n392dte** *threshold*
 - **no n392dte**
 - **n393dce** *count*
 - **no n393dce**
 - **n393dte** *count*
 - **no n393dte**
 - **t391dte** *keepalive*
 - **no t391dte**
 - **t392dce** *keepalive*
 - **no t392dce**
 - **idle-cycle-flag** {flags | ones}
 - **no idle-cycle-flag**
 - **idle-payload-fill** {all-ones | pattern pattern}
 - **no idle-payload-fill**
 - **mode** access
 - **mtu** *mtu-bytes*
 - **no mtu**
 - [no] **ppp**
 - **keepalive** *time-interval* [**dropcount** *drop-count*]
 - [no] **shutdown**
 - **character-length** {6 | 7 | 8}
 - **clock-source** slave
 - **control-lead** {input | output}
 - **input**
 - **c-i** {high | low | end-to-end}
 - **monitor**
 - **c-i** {on | off}
 - **output**
 - **i-c** {high | low | end-to-end}
 - **data-position** {F0-B5 | F0-B6}
 - **device-gender** {dte | dce}
 - **device-mode** {synchronous | asynchronous}
 - **duplex** {half | full}
 - **hold-time** {[**up** *hold-time-up*] [**down** *hold-time-down*]}
 - **no hold-time**
 - **loopback** {bidir-b | bidir-e}
 - **no loopback**
 - **multi-drop** {disabled | slave | master}
 - **parity** {odd | even | mark | space}
 - **no parity**
 - [no] **report-alarm** {hcmOof | hcmRai}
 - **s-bit-signaling** {on | off}
 - [no] **shutdown**
 - **speed** {1200 | 2400 | 4800 | 9600 | 19200 | 38400 | 56000 | 64k | 128k | 256k | 384k | 512k | 640k | 768k | 896k | 1024k | 1152k | 1280k | 1408k | 1536k | 1664k | 1792k | 1920k}

3.13.1.17 SONET/SDH Commands

```

config
— [no] port {port-id}
— sonet-sdh
— clock-source {loop-timed | node-timed}
— framing {sonet | sdh}
— group sonet-sdh-index payload {tu3 | vt2 | vt15}
— hold-time {[up hold-time-up] [down hold-time-down]}
— no hold-time
— loopback {line | internal}
— no loopback
— [no] path [sonet-sdh-index]
— atm
— cell-format cell-format
— min-vp-vpi value
— crc {16 | 32}
— description description-string
— no description
— encap-type {atm | ppp-auto}
— no encap-type
— mode {access | network}
— mtu mtu
— no mtu
— network
— accounting-policy policy-id
— [no] accounting-policy
— [no] collect-stats
— queue-policy name
— no queue-policy
— payload {sts12 | sts3 | tug3 | ds3 | e3 | vt2 | vt15 | ds1 | e1}
— ppp
— keepalive time-interval [dropcount drop-count]
— no keepalive
— [no] report-alarm [pais] [plop] [prdi] [pplm] [prei] [puneq]
— [no] scramble
— [no] shutdown
— signal-label value
— no signal-label
— trace-string [trace-string]
— no trace-string
— [no] report-alarm [loc] [lais] [lrldi] [lb2er-sd] [lb2er-sf] [slof] [slos] [lrei]
— section-trace {increment-z0 | byte value | string string}
— speed {oc3}
— no speed
— threshold {ber-sd | ber-sf} rate threshold-rate
— no threshold {ber-sd | ber-sf}
— [no] tx-dus

```

3.13.1.18 TDM Commands

```

config
  — [no] port port-id
    — tdm
      — buildout {long | short}
      — [no] codir
        — [no] channel-group channel-group-id
          — description description-string
          — no description
          — encap-type cem
          — mode access
          — [no] shutdown
        — loopback {internal | line}
        — no loopback
        — report-alarm {ais | los}
        — no report-alarm
        — [no] shutdown
        — [no] timing-8k
      — [no] ds1 ds1-id
      — [no] ds3 [sonet-sdh-index]
      — [no] e1 e1-id
      — [no] e3 [sonet-sdh-index]
      — encoding {b8zs | ami}
      — length {133 | 266 | 399 | 533 | 655}
      — line-impedance {75 | 100 | 120}
      — [no] tpif
        — [no] channel-group channel-group-id
          — description description-string
          — no description
          — encap-type cem
          — mode access
          — [no] shutdown
          — timeslots timeslots
        — loopback {internal | line}
        — no loopback
        — report-alarm {los | rai}
        — no report-alarm
        — [no] shutdown

```

3.13.1.19 DS1 Commands

```

config
  — [no] port {port-id | aps-group-id}
    — tdm
      — [no] ds1 ds1-id
        — [no] channel-group channel-group-id
          — atm
            — cell-format cell-format
            — min-vp-vpi value

```

-
- **cisco-hdlc**
 - **down-count** *down-count*
 - **no down-count**
 - **keepalive** *time-interval*
 - **no keepalive**
 - **up-count** *up-count*
 - **no up-count**
 - **crc** {16 | 32}
 - **description** *description-string*
 - **no description**
 - **encap-type** {atm | cem | ipcp | ppp-auto | frame-relay | hdlc | cisco-hdlc}
 - **no encap-type**
 - **frame-relay**
 - **lmi-type** {ansi | itu | none | rev1}
 - **mode** {dce | dte | bidir}
 - **n391dte** *intervals*
 - **no n391dte**
 - **n392dce** *threshold*
 - **no n392dce**
 - **n392dte** *threshold*
 - **no n392dte**
 - **n393dce** *count*
 - **no n393dce**
 - **n393dte** *count*
 - **no n393dte**
 - **t391dte** *keepalive*
 - **no t391dte**
 - **t392dce** *keepalive*
 - **no t392dce**
 - **idle-cycle-flag** {flags | ones}
 - **no idle-cycle-flag**
 - **idle-payload-fill** {all-ones | pattern *pattern*}
 - **no idle-payload-fill**
 - **idle-signal-fill** {all-ones | pattern *pattern*}
 - **no idle-signal-fill**
 - **mac** *ieee-address*
 - **no mac**
 - **mode** {access | network}
 - **no mode**
 - **mtu** *mtu-bytes*
 - **no mtu**
 - **network**
 - **accounting-policy** *policy-id*
 - [no] **accounting-policy**
 - [no] **collect-stats**
 - **queue-policy** *name*
 - **no queue-policy**
 - [no] **ppp**
 - **ber-sf-link-down**
 - **no ber-sf-link-down**
 - **keepalive** *time-interval* [**dropcount** *drop-count*]
 - **no keepalive**
 - [no] **scramble**

- [no] **signal-mode** **cas**
- [no] **shutdown**
- **timeslots** *timeslots*
- **no timeslots**
- **clock-source** {**loop-timed** | **node-timed** | **adaptive** | **differential**}
- **framing (DS1)** {**esf** | **sf** | **ds1-unframed**}
- **hold-time** {[**up** *hold-time-up*] [**down** *hold-time-down*]}
- **no hold-time**
- **loopback (DS1)** {**line** | **internal** | **fdl-ansi** | **fdl-bellcore** | **payload-ansi**}
- **no loopback (DS1)**
- [no] **remote-loop-respond**
- [no] **report-alarm** {**ais** | **los** | **oof** | **rai** | **looped** | **ber-sd** | **ber-sf**}
- [no] **signal-mode** **cas**
- [no] **shutdown**
- **threshold** {**ber-sd** | **ber-sf**} **rate** *threshold-rate*
- **no threshold** {**ber-sd** | **ber-sf**}

3.13.1.20 DS3 Commands

- ```

config
 — [no] port {port-id | aps-group-id}
 — tdm
 — [no] ds3 [sonet-sdh-index]
 — atm
 — cell-format cell-format
 — no cell-format
 — mapping direct
 — no mapping
 — min-vp-vpi value
 — no min-vp-vpi
 — channelized {ds1 | e1}

```

- 
- **no n393dte**
  - **t391dte** *keepalive*
  - **no t391dte**
  - **t392dce** *keepalive*
  - **no t392dce**
  - **framing (DS3)** {c-bit | m23}
  - **idle-cycle-flag** {flags | ones}
  - **no idle-cycle-flag**
  - **loopback** {line | internal | remote}
  - **no loopback**
  - **mac** *ieee-address*
  - **no mac**
  - **mdl** {eic | lic | fic | unit | pfi | port | gen} mdl-string
  - **[no] mdl**
  - **[no] mdl-transmit** {path | idle-signal | test-signal}
  - **mode** {access | network}
  - **mtu** *mtu-bytes*
  - **no mtu**
  - **network**
    - **accounting-policy** *policy-id*
    - **[no] accounting-policy**
    - **[no] collect-stats**
    - **queue-policy** *name*
    - **no queue-policy**
  - **ppp**
    - **keepalive** *time-interval* [**dropcount** *drop-count*]
    - **no keepalive**
  - **[no] report-alarm** {ais | los | oof | rai | looped}
  - **[no] shutdown**

### 3.13.1.21 E1 Commands

```

config
 — [no] port {port-id | aps-group-id}
 — tdm
 — [no] e1 e1-id
 — [no] channel-group channel-group-id
 — atm
 — cell-format cell-format
 — min-vp-vpi value
 — cisco-hdlc
 — down-count down-count
 — no down-count
 — keepalive time-interval
 — no keepalive
 — up-count up-count
 — no up-count
 — crc {16 | 32}
 — description description-string
 — no description
 — encap-type {atm | cem | ipcp | ppp-auto | frame-relay | hdlc |
 cisco-hdlc}
 — no encap-type
 — frame-relay
 — lmi-type {ansi | itu | none | rev1}
 — mode {dce | dte | bidir}
 — n391dte intervals
 — no n391dte
 — n392dce threshold
 — no n392dce
 — n392dte threshold
 — no n392dte
 — n393dce count
 — no n393dce
 — n393dte count
 — no n393dte
 — t391dte keepalive
 — no t391dte
 — t392dce keepalive
 — no t392dce
 — idle-cycle-flag {flags | ones}
 — no idle-cycle-flag
 — idle-payload-fill {all-ones | pattern pattern}
 — no idle-payload-fill
 — idle-signal-fill {all-ones | pattern pattern}
 — no idle-signal-fill
 — mac ieee-address
 — no mac
 — mode {access | network}
 — no mode
 — mtu mtu-bytes
 — no mtu
 — network

```

---

```

— accounting-policy policy-id
— [no] accounting-policy
— [no] collect-stats
— queue-policy name
— no queue-policy
— [no] ppp
— ber-sf-link-down
— no ber-sf-link-down
— keepalive time-interval [dropcount drop-count]
— no keepalive
— [no] scramble
— [no] signal-mode cas
— [no] shutdown
— timeslots timeslots
— no timeslots
— clock-source {loop-timed | node-timed | adaptive | differential}
— framing (E1) {no-crc-g704 | g704 | e1-unframed}
— hold-time {[up hold-time-up] [down hold-time-down]}
— no hold-time
— loopback (E1) {line | internal}
— no loopback (E1)
— [no] report-alarm {ais | los | oof | rai | looped | ber-sd | ber-sf}
— [no] signal-mode cas
— [no] shutdown
— ssm
— [no] shutdown
— ssm-bit sa-bit
— no ssm-bit
— [no] tx-dus
— threshold {ber-sd | ber-sf} rate threshold-rate
— no threshold {ber-sd | ber-sf}

```

### 3.13.1.22 E3 Commands

```

config
— [no] port {port-id}
— tdm
— [no] e3 [sonet-sdh-index]
— atm
— cell-format cell-format
— no cell-format
— min-vp-vpi value
— no min-vp-vpi
— clock-source {loop-timed | node-timed | differential | free-run}
— crc {16 | 32}
— description description-string
— no description
— encap-type {atm | cem | ppp-auto | frame-relay}
— no encap-type
— [no] feac-loop-respond
— frame-relay

```



- **lmi-type** {ansi | itu | none | rev1}
- **mode** {dce | dte | bidir}
- **n391dte** *intervals*
- **no n391dte**
- **n392dce** *threshold*
- **no n392dce**
- **n392dte** *threshold*
- **no n392dte**
- **n393dce** *count*
- **no n393dce**
- **n393dte** *count*
- **no n393dte**
- **t391dte** *keepalive*
- **no t391dte**
- **t392dce** *keepalive*
- **no t392dce**
- **framing (E3) g751**
- **idle-cycle-flag** {flags | ones}
- **no idle-cycle-flag**
- **loopback** {line | internal | remote}
- **no loopback**
- **mode** {network}
- **mtu** *mtu-bytes*
- **no mtu**
- **network**
  - **accounting-policy** *policy-id*
  - **[no] accounting-policy**
  - **[no] collect-stats**
  - **queue-policy** *name*
  - **no queue-policy**
- **ppp**
  - **keepalive** *time-interval* [**dropcount** *drop-count*]
  - **no keepalive**
- **[no] report-alarm** {ais | los | oof | rai | looped}
- **[no] shutdown**

### 3.13.1.23 Voice Commands

- ```

config
  — [no] port port-id
    — voice
      — audio-wires {two-wires | four-wires}
      — [no] em
        — [no] channel-group channel-group-id
          — description description-string
          — no description
          — encap-type cem
          — no encap-type
          — mode access
          — [no] shutdown
        — fault-signaling {idle | seized}

```

```

— idle-code abcd-code
— no idle-code
— loopback {internal-analog | internal-digital}
— no loopback
— seized-code abcd-code
— signaling-lead
  — e {high | low | end-to-end}
  — m {high | low | end-to-end}
— signaling-mode {em | transmission-only}
— [no] shutdown
— [no] fxo
  — [no] channel-group channel-group-id
    — description description-string
    — no description
    — encap-type cem
    — no encap-type
    — mode access
    — [no] shutdown
  — fault-signaling {idle | seized}
  — loopback internal-digital
  — no loopback
  — [no] shutdown
— [no] fxs
  — [no] channel-group channel-group-id
    — description description-string
    — no description
    — encap-type cem
    — no encap-type
    — mode access
    — [no] shutdown
  — fault-signaling {idle | seized}
  — loopback internal-digital
  — no loopback
  — [no] shutdown
— line-balance {nominal | 800}
— ring-generation {16 | 20 | 25}
— no ring-generation
— signaling-type {3600plar | 1511plar | 3600ls | 1511profile1 | 3600re}
— tlp-rx decibels
— tlp-tx decibels

```

3.13.1.24 LAG Commands

```

config
— [no] lag [lag-id]
  — access
    — adapt-qos {link | distribute}
  — description description-string
  — no description
  — [no] dynamic-cost
  — encap-type {dot1q | null | QinQ}

```

- **no encap-type**
- **hold-time** *down* *hold-down-time*
- **no hold-time**
- **lcp** [*mode*] [**administrative-key** *admin-key*]
- **no lcp**
- **lcp-xmit-interval** {*slow* | *fast*}
- **no lcp-xmit-interval**
- [**no**] **lcp-xmit-stdby**
- **mac** *ieee-address*
- **no mac**
- **mode** {*access* | *network* | *hybrid*}
- **no mode**
- **port** *port-id* [*port-id*] [**priority** *priority*] [**sub-group** *sub-group-id*]
- **no port** *port-id*
- **port-threshold** *value* [**action** {*dynamic-cost* | *down*}]
- **no port-threshold**
- **selection-criteria** [*best-port* | *highest-count* | *highest-weight*] [**slave-to-partner**]
[*subgroup-hold-time* *hold-time*]
- **no selection-criteria**
- [**no**] **shutdown**
- **standby-signaling** [*lcp* | *power-off*]
- **no standby-signaling**

3.13.1.25 SCADA Commands

- ```
config
— scada bridge-id
 — [no] branch branch-id
 — description description-string
 — no description
 — gain
 — input decibels
 — output decibels
 — [no] sidetone (see Note:)
 — [no] shutdown
 — [no] squellch
 — description description-string
 — no description
 — mddb
 — force-active master branch-id
 — redundant-mode redundant-mode
 — [no] report-alarm [hcmOof] [hcmRai]
 — speed {600 | 1200 | 2400 | 4800 | 9600 | 19200 | 38400 | 56000}
 — squellch timeout timeout
 — squellch reset
 — no squellch
 — squellch-recovery [mode] [time time]
 — pcm
 — force-active master branch-id
 — redundant-mode redundant-mode
 — squellch timeout timeout
```

- **sqelch** **reset**
- **no sqelch**
- **sqelch-recovery** [*mode*] [**time** *time*]
- [**no**] **shutdown**
- **vcb**
  - **idle-code** *abcd-code*
  - **no idle-code**
  - **seized-code** *abcd-code*
  - **no seized-code**



**Note:** The **sidetone** command is not supported in this release.

---

## 3.13.2 Command Descriptions

- [Generic Commands](#)
- [Card Commands](#)
- [Adapter Card Commands](#)
- [Interface QoS Commands](#)
- [External Alarm Commands](#)
- [APS Port Commands](#)
- [Microwave Link Commands](#)
- [General Port Commands](#)
- [Ethernet Commands](#)
- [DSL Commands](#)
- [GPON Commands](#)
- [GNSS Commands](#)
- [IEEE 802.1x Ethernet Port Commands](#)
- [LLDP Ethernet Port Commands](#)
- [Ring MAC Operations Commands](#)
- [Serial Commands](#)
- [RS-232, V.35, and X.21 Channel Group Commands](#)
- [SONET/SDH Port Commands](#)
- [SONET/SDH Path Commands](#)
- [Network Port Commands](#)
- [Multilink Bundle and IMA Group Commands](#)
- [ATM Interface Commands](#)
- [TDM Commands](#)
- [DS1 and E1 Commands](#)
- [DS1 and E1 Channel Group Commands](#)
- [DS3 and E3 Commands](#)
- [Voice Commands](#)
- [Voice Channel Group Commands](#)
- [LAG Commands](#)
- [Frame Relay Commands](#)
- [Cisco HDLC Commands](#)
- [SCADA Commands](#)

### 3.13.2.1 Generic Commands

#### description

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>description</b> <i>description-string</i><br><b>no description</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Context</b>     | config>external-alarms>alarm<br>config>external-alarms>input<br>config>external-alarms>output<br>config>port<br>config>port>tdm>ds1>channel-group<br>config>port>tdm>ds3<br>config>port>tdm>e1>channel-group<br>config>port>tdm>e3<br>config>port>tdm>codir>channel-group<br>config>port>tdm>tpif>channel-group<br>config>port>voice>fxo>channel-group<br>config>port>voice>fxs>channel-group<br>config>port>sonet-sdh>path<br>config>port>serial>rs232>channel-group<br>config>port>serial>rs232>socket<br>config>port>serial>v35>channel-group<br>config>port>serial>x21>channel-group<br>config>port>voice>em>channel-group<br>config>lag<br>config>scada<br>config>scada>branch |
| <b>Description</b> | This command creates a text description for a configuration context to help identify the content in the configuration file.<br><br>The <b>no</b> form of this command removes any description string from the context. For the serial context, the <b>no</b> form of this command restores the default value.                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Default</b>     | “DS0GRP” (for the serial context and the voice context)<br><br>“Discrete Digital Input” for digital input (for Auxiliary Alarm card or chassis alarm inputs),<br>“Analog Input” for analog input, and “Digital Output Relay” for output (for Auxiliary Alarm card)<br><br>n/a for others                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Parameters</b>  | <i>description-string</i> — description character string. Allowed values are any string up to 80 or 160 characters long (depending on the command) composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.                                                                                                                                                                                                                                                                                                                                                         |

## shutdown

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] shutdown</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | <pre> config&gt;card config&gt;card&gt;mda config&gt;port&gt;dsl&gt;down-when-looped config&gt;port&gt;dsl&gt;efm-oam config&gt;port&gt;dsl&gt;line config&gt;dsl&gt;ssm config&gt;external-alarms&gt;alarm config&gt;external-alarms&gt;input config&gt;external-alarms&gt;output config&gt;port config&gt;port&gt;ethernet&gt;down-when-looped config&gt;port&gt;ethernet&gt;efm-oam config&gt;port&gt;ethernet&gt;ssm config&gt;port&gt;gpon&gt;down-when-looped config&gt;port&gt;mw-link config&gt;port&gt;serial&gt;rs232 config&gt;port&gt;serial&gt;v35 config&gt;port&gt;serial&gt;x21 config&gt;port&gt;serial&gt;rs232&gt;channel-group config&gt;port&gt;serial&gt;rs232&gt;socket config&gt;port&gt;serial&gt;v35&gt;channel-group config&gt;port&gt;serial&gt;x21&gt;channel-group config&gt;port&gt;sonet-sdh&gt;path config&gt;port&gt;tdm&gt;ds1 config&gt;port&gt;tdm&gt;ds1&gt;channel-group config&gt;port&gt;tdm&gt;ds3 config&gt;port&gt;tdm&gt;e1 config&gt;port&gt;tdm&gt;e1&gt;ssm config&gt;port&gt;tdm&gt;e1&gt;channel-group config&gt;port&gt;tdm&gt;e3 config&gt;port&gt;tdm&gt;codir config&gt;port&gt;tdm&gt;codir&gt;channel-group config&gt;port&gt;tdm&gt;tpif config&gt;port&gt;tdm&gt;tpif&gt;channel-group config&gt;port&gt;voice&gt;fxo config&gt;port&gt;voice&gt;fxs config&gt;port&gt;voice&gt;fxo&gt;channel-group config&gt;port&gt;voice&gt;fxs&gt;channel-group config&gt;port&gt;voice&gt;em config&gt;port&gt;voice&gt;em&gt;channel-group config&gt;lag config&gt;scada config&gt;scada&gt;branch </pre> |
| <b>Description</b> | This command administratively disables an entity. When disabled, an entity does not change, reset, or remove any configuration settings or statistics.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

The operational state of the entity is disabled as well as the operational state of any entities contained within. Many objects must be shut down before they can be deleted.

When used with the **ethernet>efm-oam** command, **shutdown** enables tunneling on the port (see [tunneling](#)), and **no shutdown** enables Ethernet EFM OAM 802.3ah.

The **no** form of this command administratively enables an entity.



**Note:** The **config>port>shutdown** command does not remove power on ports that are Power over Ethernet (PoE/PoE+) capable. You must use the **config>port>ethernet>no poe** command to turn the power off; see [poe](#) for more information.

|                |                                                                         |
|----------------|-------------------------------------------------------------------------|
| <b>Default</b> | card – no shutdown                                                      |
|                | dsl – no shutdown                                                       |
|                | mda – no shutdown                                                       |
|                | port – shutdown                                                         |
|                | scada – shutdown                                                        |
|                | scada>branch – no shutdown                                              |
|                | input – no shutdown (for Auxiliary Alarm card and chassis alarm inputs) |
|                | alarm – shutdown (for Auxiliary Alarm card)                             |
|                | output – shutdown (for Auxiliary Alarm card)                            |
|                | lag – shutdown                                                          |



---

### 3.13.2.2 Card Commands

#### card

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] card</b> <i>slot-number</i>                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b> | This mandatory command is the first step in activating the IOM software: designating it a slot position in the chassis. On the 7705 SAR, the slot number is always <b>1</b> . The IOM software must be activated before the adapter cards and ports can be configured. The <b>no</b> form of this command removes the card from the configuration. All associated ports, services, and adapter cards must be shut down. |
| <b>Default</b>     | n/a                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Parameters</b>  | <i>slot-number</i> — the slot number of the card in the chassis                                                                                                                                                                                                                                                                                                                                                         |
| <b>Values</b>      | 1                                                                                                                                                                                                                                                                                                                                                                                                                       |

#### card-type

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>card-type</b> <i>card-type</i><br><b>no card-type</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>card                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | <p>This mandatory command is the second step in activating the IOM software: designating the card type. The card type can be preprovisioned, meaning that the card does not need to be installed in the chassis. On the 7705 SAR, the card type is always <b>iom-sar</b>.</p> <p>A card must be provisioned (configured) before an adapter card or port can be configured.</p> <p>A card can only be provisioned in a slot that is vacant, which means that no other card can be provisioned for that particular slot. To reconfigure a slot position, use the <b>no</b> form of this command to remove the current information. Port and adapter card information must be shut down.</p> <p>A card can only be provisioned in a slot if the card type is allowed in the slot. An error message is generated if an attempt is made to provision a card type that is not allowed.</p> <p>The <b>no</b> form of this command removes the card from the configuration. This operation requires that the card be administratively shut down. All dependencies to ports on this card must be shut down and removed from the configuration before issuing the <b>no card-type</b> command.</p> |
| <b>Default</b>     | n/a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

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|                   |                                                                                |
|-------------------|--------------------------------------------------------------------------------|
| <b>Parameters</b> | <i>card-type</i> — the type of card to be configured and installed in the slot |
| <b>Values</b>     | iom-sar                                                                        |

### 3.13.2.3 Adapter Card Commands

mda

|                    |                                                                                                                                                                                                                                                                                                     |                                                 |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|
| <b>Syntax</b>      | [no] <b>mda</b> <i>mda-slot</i>                                                                                                                                                                                                                                                                     |                                                 |
| <b>Context</b>     | config>card                                                                                                                                                                                                                                                                                         |                                                 |
| <b>Description</b> | This mandatory command enables access to a card's MDA CLI context to configure adapter cards.                                                                                                                                                                                                       |                                                 |
| <b>Default</b>     | n/a                                                                                                                                                                                                                                                                                                 |                                                 |
| <b>Parameters</b>  | <i>mda-slot</i> — the adapter card or module slot number to be configured                                                                                                                                                                                                                           |                                                 |
|                    | <b>Values</b>                                                                                                                                                                                                                                                                                       |                                                 |
|                    | 1 to 6                                                                                                                                                                                                                                                                                              | on the 7705 SAR-8                               |
|                    | 1 to 12 and X1 to X4 for XMDA cards                                                                                                                                                                                                                                                                 | on the 7705 SAR-18                              |
|                    | 1 (for Ethernet), 2 (for T1/E1), and 3 (for module)                                                                                                                                                                                                                                                 | on the 7705 SAR-M variants that support modules |
|                    | 1 (for Ethernet) and 2 (for T1/E1)                                                                                                                                                                                                                                                                  | on the 7705 SAR-A                               |
|                    | 1 (for Ethernet) and 2 (for GNSS RF)                                                                                                                                                                                                                                                                | on the 7705 SAR-Ax                              |
|                    | 1 (for Ethernet)                                                                                                                                                                                                                                                                                    | on the 7705 SAR-W                               |
|                    | 1 (for Ethernet) and 2 (for DSL on the variant that supports xDSL)                                                                                                                                                                                                                                  | on the 7705 SAR-Wx                              |
|                    | 1 (for Ethernet), 2 (for module position 1), and 3 (for module position 2)                                                                                                                                                                                                                          | on the 7705 SAR-H                               |
|                    | 1 (for Ethernet) and 2 (for RS-232)                                                                                                                                                                                                                                                                 | on the 7705 SAR-Hc                              |
|                    | 1 (for T1/E1); 2 (for Ethernet XOR RJ-45 ports 2/1A and 2/2A, Ethernet XOR SFP ports 2/1B and 2/2B, Ethernet ports 2/3 to 2/6, and 10GigE SFP+ port 2/7); 3 (for Ethernet XOR RJ-45 ports 3/1A and 3/2A, Ethernet XOR SFP ports 3/1B and 3/2B, Ethernet ports 3/3 to 3/6, and 10GigE SFP+ port 3/7) | on the 7705 SAR-X                               |

ais-propagation

|                |                                           |
|----------------|-------------------------------------------|
| <b>Syntax</b>  | <b>ais-propagation</b> {enable   disable} |
| <b>Context</b> | config>card>mda                           |

**Description** This command enables the 7705 SAR to interoperate with SDH networks that use subnetwork connection protection (SNCP). When **ais-propagation** is enabled, the 7705 SAR can use SDH signaling to make pseudowire switching decisions on Cpipes configured for redundancy.

For more information about 7705 SAR interoperoperation with SDH SNCP, refer to the 7705 SAR Services Guide, “AIS Fault Propagation”.

**Default** n/a

## clock-mode

**Syntax** **clock-mode adaptive**

**clock-mode {dcr-acr | differential} [timestamp-freq {19440 | 25000 | 77760 | 103680}]**

**Context** config>card>mda

**Description** This command defines the clocking mode and the associated timestamp frequency (if **differential** or **dcr-acr** clocking mode is configured).

All clock modes are supported on the following:

- 16-port T1/E1 ASAP Adapter card, version 2
- 32-port T1/E1 ASAP Adapter card
- 7705 SAR-A (variant with T1/E1 ports)
- 7705 SAR-M (variants with T1/E1 ports)
- 7705 SAR-X
- T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module (the clock frequency value configured for **dcr-acr** clock mode or **differential** clock mode on one module will take effect on both modules installed in the 7705 SAR-H)

Only **adaptive** mode is supported on the following chassis and cards:

- 16-port T1/E1 ASAP Adapter card, version 1

Only **differential** mode is supported on the following cards:

- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card (DS1/E1 channels)
- 4-port DS3/E3 Adapter card (clear channel DS3/E3 ports and DS1/E1 channels on channelized DS3 ports (E3 ports cannot be channelized)); differential mode on DS1/E1 channels is supported only on the first three ports of the card

**Default** adaptive (if no clocking mode is configured)

differential (for 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card and 4-port DS3/E3 Adapter card)

If **differential** or **dcr-acr** clocking mode is configured on the 7705 SAR-M, 7705 SAR-A, 7705 SAR-X, or 4-port T1/E1 and RS-232 Combination module, the default timestamp frequency is **103680**.

If **differential** or **dcr-acr** clocking mode is configured on the 16-port T1/E1 ASAP Adapter card, version 2, or the 32-port T1/E1 ASAP Adapter card, the default timestamp frequency is **77760**.

For the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card and the 4-port DS3/E3 Adapter card, the default timestamp frequency is **77760**.

- Parameters**
- adaptive** — enables adaptive clock recovery
  - dcr-acr** — enables DCR and ACR on different ports of the same card
  - differential** — enables differential clock recovery
  - timestamp-freq** — sets the optional timestamp frequency
  - 19440** — sets the timestamp frequency to 19440 Hz (19.44 MHz) for Y.1413 compliance
  - 25000** — sets the timestamp frequency to 25000 Hz (25 MHz) for Ethernet-based systems
  - 77760** — sets the timestamp frequency to 77760 Hz (77.76 MHz) for interoperation with SONET/SDN-based systems such as TSS-5
  - 103680** — sets the timestamp frequency to 103680 Hz (103.68 MHz), recommended for any operation over 100 MHz



**Note:** The 25000 and 103680 options are not supported on the 16-port T1/E1 ASAP Adapter card, version 2, or the 32-port T1/E1 ASAP Adapter card. The 19440, 25000, and 103680 options are not supported on the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card or the 4-port DS3/E3 Adapter card.

fabric-stats-enabled

- Syntax** [no] fabric-stats-enabled
- Context** config>card>mda
- Description** This command enables the fabric port statistics counter to count egress traffic toward a specified adapter card. The CSM allows the collection of fabric statistics from only one fabric port at any given time. To change the port statistics counter to a different adapter card, turn off statistics collection on the assigned adapter card by using **no fabric-stats-enabled** and then enabling statistics collection on another adapter card.

## mda-mode

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |               |                                                              |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------------------------------------------------|
| <b>Syntax</b>      | <b>mda-mode</b> <i>mda-mode</i><br><b>no mda-mode</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |               |                                                              |
| <b>Context</b>     | config>card>mda                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |               |                                                              |
| <b>Description</b> | <p>This command configures the set of software services that are enabled for a specific adapter card.</p> <p>The <b>cem-atm-ppp</b> and <b>cem-fr-hdlc-ppp</b> parameter values are used to configure the appropriate encapsulation methods that are required to support pseudowire services. These values apply to the following adapter cards:</p> <ul style="list-style-type: none"> <li>• 16-port T1/E1 ASAP Adapter card, version 2</li> <li>• 32-port T1/E1 ASAP Adapter card</li> <li>• 4-port DS3/E3 Adapter card</li> </ul> <p>The card-level encapsulation capabilities must be configured before the <b>encap-type</b> parameter is configured at the port level.</p> <p>The <b>x10-1gb-sfp</b> and <b>x1-10gb-sf+</b> parameter values are used for the 10-port 1GigE/1-port 10GigE X-Adapter card to define whether the card operates in 10-port 1GigE mode or 1-port 10GigE mode.</p> <p>The <b>p4-oc3</b> and <b>p1-oc12</b> parameter values are used for the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card to define whether the card operates in 4-port OC3/STM1 mode or 1-port OC12/STM4 mode.</p> <p>The <b>mddb</b>, <b>pcm</b>, and <b>vcb</b> parameter values are used for the Integrated Services card to define which SCADA application is active on the card.</p> <p>The <b>no</b> form of this command sets the <b>mda-mode</b> back to the card's default mode. All service and port/channel configurations associated with the adapter card must be removed before the <b>mda-mode</b> can be changed. On the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card, changing the mode causes the adapter card to reset.</p> |               |                                                              |
| <b>Default</b>     | <p>x1-10gb-sf+ (for the 10-port 1GigE/1-port 10GigE X-Adapter card)</p> <p>cem-atm-ppp (for the T1/E1 ASAP adapter cards and 4-port DS3/E3 Adapter card)</p> <p>p4-oc3 (for the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card)</p> <p>mddb (for the Integrated Services card)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |               |                                                              |
| <b>Parameters</b>  | <p><i>mda-mode</i> — the encapsulation mode for the adapter card to be provisioned</p> <table> <tr> <td><b>Values</b></td><td> cem-atm-ppp<br/> cem-fr-hdlc-ppp<br/> x10-1gb-sfp<br/> x1-10gb-sf+ </td></tr> </table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Values</b> | cem-atm-ppp<br>cem-fr-hdlc-ppp<br>x10-1gb-sfp<br>x1-10gb-sf+ |
| <b>Values</b>      | cem-atm-ppp<br>cem-fr-hdlc-ppp<br>x10-1gb-sfp<br>x1-10gb-sf+                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |               |                                                              |

p4-oc3  
p1-oc12  
mddb  
pcm  
vcb

mda-type

|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Syntax      | <b>mda-type</b> <i>mda-type</i><br><b>no mda-type</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Context     | config>card>mda                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Description | <p>This mandatory command provisions a specific adapter card or module type to the device configuration for the slot. The adapter card or module can be preprovisioned, but it must be provisioned before ports can be configured. Ports can be configured once the adapter card or module is properly provisioned.</p> <p>A maximum of 6 adapter cards can be installed in a 7705 SAR-8 chassis, and a maximum of 12 adapter cards and 4 XMDA adapter cards can be installed in a 7705 SAR-18 chassis. One module can be installed in 7705 SAR-M variants that support modules. A maximum of two modules can be installed in a 7705 SAR-H chassis. Only one adapter card or module can be provisioned per MDA or module slot. To modify an MDA or module slot, shut down all port associations.</p> <p>A medium severity alarm is generated if an adapter card or module is inserted that does not match the adapter card or module type configured for the slot. This alarm is cleared when the correct adapter card or module is inserted or the configuration is modified. A high severity alarm is raised if an administratively enabled adapter card or module is removed from the chassis. This alarm is cleared if either the correct adapter card or module type is inserted or the configuration is modified. A low severity trap is issued if an administratively disabled adapter card or module is removed.</p> <p>An alarm is raised if partial or complete adapter card or module failure is detected. The alarm is cleared when the error condition ceases.</p> <p>The <b>no</b> form of this command deletes the adapter card or module from the configuration. The adapter card or module must be administratively shut down before it can be deleted from the configuration. Before an adapter card or module can be shut down, all port associations with this adapter card or module, for example SAPs and IP interfaces, must be shut down first.</p> |
| Default     | n/a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Parameters  | <i>mda-type</i> — the type of adapter card to be provisioned                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|             | <b>Values</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

**For the 7705 SAR-8**

|               |                                                 |
|---------------|-------------------------------------------------|
| a16-chds1     | 16-port T1/E1 ASAP Adapter card, version 1      |
| a16-chds1v2   | 16-port T1/E1 ASAP Adapter card, version 2      |
| a32-chds1v2   | 32-port T1/E1 ASAP Adapter card                 |
| a12-sdi       | 12-port Serial Data Interface card, version 1   |
| a12-sdiv2     | 12-port Serial Data Interface card, version 2   |
| a6-eth-10G    | 6-port Ethernet 10Gbps Adapter card             |
| a8-eth        | 8-port Ethernet Adapter card, version 1         |
| a8-ethv2      | 8-port Ethernet Adapter card, version 2         |
| a8-1gb-sfp    | 8-port Gigabit Ethernet Adapter card, version 1 |
| a8-1gb-v2-sfp | 8-port Gigabit Ethernet Adapter card, version 2 |
| a8-1gb-v3-sfp | 8-port Gigabit Ethernet Adapter card, version 3 |
| a6-em         | 6-port E&M Adapter card                         |
| a4-oc3        | 4-port OC3/STM1 Clear Channel Adapter card      |
| a4-chds3      | 4-port DS3/E3 Adapter card                      |
| a2-choc3      | 2-port OC3/STM1 Channelized Adapter card        |
| a4-choc3/12   | 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card |
| a2-10gb-xfp   | 2-port 10GigE (Ethernet) Adapter card           |
| aux-alarm     | Auxiliary Alarm card                            |
| mw-pic-2      | Power Injector card                             |
| a8-pmc        | Packet Microwave Adapter card                   |
| a8-vt         | 8-port Voice & Teleprotection card              |
| a8-fxo        | 8-port FXO Adapter card                         |
| a6-fxs        | 6-port FXS Adapter card                         |
| oadm-cwdm-1ch | CWDM OADM Adapter card (1-channel)              |
| oadm-cwdm-2ch | CWDM OADM Adapter card (2-channel)              |
| oadm-cwdm-4ch | CWDM OADM Adapter card (4-channel)              |
| oadm-cwdm-8ch | CWDM OADM Adapter card (8-channel)              |
| isc           | Integrated Services card                        |
| a1-gnss       | GNSS Receiver card                              |

**For the 7705 SAR-18**

|             |                                               |
|-------------|-----------------------------------------------|
| a16-chds1v2 | 16-port T1/E1 ASAP Adapter card, version 2    |
| a32-chds1v2 | 32-port T1/E1 ASAP Adapter card               |
| a12-sdi     | 12-port Serial Data Interface card, version 1 |
| a12-sdiv2   | 12-port Serial Data Interface card, version 2 |
| a6-eth-10G  | 6-port Ethernet 10Gbps Adapter card           |
| a8-ethv2    | 8-port Ethernet Adapter card, version 2       |



---

|               |                                                       |
|---------------|-------------------------------------------------------|
| a8-1gb-sfp    | 8-port Gigabit Ethernet Adapter card, version 1       |
| a8-1gb-v2-sfp | 8-port Gigabit Ethernet Adapter card, version 2       |
| a8-1gb-v3-sfp | 8-port Gigabit Ethernet Adapter card, version 3       |
| x-10GigE      | 10-port 1GigE/1-port 10GigE X-Adapter card, version 1 |
| x-10GigE-v2   | 10-port 1GigE/1-port 10GigE X-Adapter card, version 2 |
| a6-em         | 6-port E&M Adapter card                               |
| a4-chds3      | 4-port DS3/E3 Adapter card                            |
| a4-oc3        | 4-port OC3/STM1 Clear Channel Adapter card            |
| a2-choc3      | 2-port OC3/STM1 Channelized Adapter card              |
| a4-choc3/12   | 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card       |
| a2-10gb-xfp   | 2-port 10GigE (Ethernet) Adapter card                 |
| aux-alarm     | Auxiliary Alarm card                                  |
| mw-pic-2      | Power Injector card                                   |
| a8-pmc        | Packet Microwave Adapter card                         |
| a8-vt         | 8-port Voice & Teleprotection card                    |
| a8-fxo        | 8-port FXO Adapter card                               |
| a6-fxs        | 6-port FXS Adapter card                               |
| oadm-cwdm-1ch | CWDM OADM Adapter card (1-channel)                    |
| oadm-cwdm-2ch | CWDM OADM Adapter card (2-channel)                    |
| oadm-cwdm-4ch | CWDM OADM Adapter card (4-channel)                    |
| oadm-cwdm-8ch | CWDM OADM Adapter card (8-channel)                    |
| isc           | Integrated Services card                              |
| a1-gnss       | GNSS Receiver card                                    |

**For the 7705 SAR-M**

|               |                                 |
|---------------|---------------------------------|
| p1-gpon       | GPON module                     |
| p8-xdsl       | 8-port xDSL module              |
| p6-dcm        | 6-port DSL Combination module   |
| oadm-cwdm-1ch | CWDM OADM module (1-channel)    |
| p2-10gb-xfp   | 2-port 10GigE (Ethernet) module |
| p6-eth        | 6-port SAR-M Ethernet module    |

**For the 7705 SAR-H**

|          |                                            |
|----------|--------------------------------------------|
| p4-combo | 4-port T1/E1 and RS-232 Combination module |
| p1-gps   | GPS Receiver module                        |
| p4-eth   | 4-port SAR-H Fast Ethernet module          |

## poe-power-source

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>poe-power-source</b> { <b>internal</b>   <b>external</b>   <b>none</b> }<br><b>no poe-power-source</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | config>card>mda                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | <p>This command specifies whether the internal system-level PoE power supply or an external PoE power supply is used to power the PoE-capable ports on a 7705 SAR chassis.</p> <p>When the 7705 SAR-H is configured for the internal power supply, standard 15 W PoE can be enabled only on ports 5 and 6. Port 5 can also support 34 W PoE+, but in that case, port 6 cannot support PoE. When configured for the external PoE power supply, all four PoE-capable ports support a combination of standard 15 W PoE and 34 W PoE+, with a maximum power delivery of 83 W among all PoE-enabled ports. Refer to the 7705 SAR-H Chassis Installation Guide, “Ethernet Ports”, for information about supported combinations and restrictions.</p> <p>The following chassis types only support the internal system-level PoE power supply:</p> <ul style="list-style-type: none"> <li>• 7705 SAR-Hc</li> <li>• 7705 SAR-W</li> <li>• 7705 SAR-Wx</li> </ul> <p>The <b>no</b> form of this command disables the PoE power supply on the node.</p> |
| <b>Default</b>     | internal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Parameters</b>  | <p><b>internal</b> — specifies that the internal PoE power source be used for the PoE-capable ports</p> <p><b>external</b> — specifies that an external PoE power source be used for the PoE-capable ports</p> <p><b>none</b> — specifies that no internal or external PoE power source is used</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

## vcb

|                    |                                                                                                                         |
|--------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>vcb</b>                                                                                                              |
| <b>Context</b>     | config>card>mda                                                                                                         |
| <b>Description</b> | This command enables the context to configure voice conference bridge (VCB) parameters on the Integrated Services card. |
| <b>Default</b>     | n/a                                                                                                                     |

---

## application

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>application</b> { <b>broadcast</b>   <b>teleprotection</b>   <b>vcb</b>   <b>vcb-branch-initiate</b> }                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>card>mda>vcb                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | This command specifies the operating mode for the VCB application. The mode is set at the card level and applies to all bridges configured on the card.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Default</b>     | vcb                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Parameters</b>  | <p><b>broadcast</b> — only one branch on the bridge (fixed as branch 1) has control of the bridge to transmit, and all other branches are in listen-only mode</p> <p><b>teleprotection</b> — each teleprotection relay transmits state information on discrete frequencies so that each relay can both hear what the other relays are transmitting as well as transmit its own information to the other relays</p> <p><b>vcb</b> — one branch talks and all other branches on the bridge can hear</p> <p><b>vcb-branch-initiate</b> — branches on the bridge are only enabled (unmuted) when the attached base station signals its presence by grounding the M-lead on the interface connected to the bridge. Upon receiving the grounded M-lead via T1/E1 ABCD bits or TDM PW signaling, the bridge unmutes the associated branch. When the ground is removed, the branch is muted again.</p> |

## voice

|                    |                                                                                                                                                                                                                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>voice</b>                                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>card>mda                                                                                                                                                                                                                                                                              |
| <b>Description</b> | This command enables the context to configure voice parameters on the 6-port E&M Adapter card, 8-port Voice & Teleprotection card, 8-port FXO Adapter card, 6-port FXS Adapter card, and Integrated Services card (when it is configured for VCB with the <a href="#">mda-mode</a> command). |
| <b>Default</b>     | n/a                                                                                                                                                                                                                                                                                          |

## companding-law

|                    |                                                                                                                                                                                                                    |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>companding-law</b> { <b>a-law</b>   <b>mu-law</b> }                                                                                                                                                             |
| <b>Context</b>     | config>card>mda>voice                                                                                                                                                                                              |
| <b>Description</b> | This command specifies the companding law to be used on the 6-port E&M Adapter card, 8-port Voice & Teleprotection card, 8-port FXO Adapter card, 6-port FXS Adapter card, and Integrated Services card (for VCB). |

To change this parameter, all ports associated with the card must be in shutdown mode and no channels can be defined on the card. A change in the companding law results in a corresponding change to the [signaling-type](#) default. The [signaling-type](#) applies only to the 6-port E&M Adapter card.

|                   |                                                                      |
|-------------------|----------------------------------------------------------------------|
| <b>Default</b>    | mu-law                                                               |
| <b>Parameters</b> | <b>a-law</b> — A-Law companding<br><b>mu-law</b> — Mu-Law companding |

signaling-type

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>signaling-type</b> { <b>type-i</b>   <b>type-ii</b>   <b>type-v</b> }                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>card>mda>voice                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | <p>This command specifies the signaling type to be used on the 6-port E&amp;M Adapter card.</p> <p>To change this parameter, all ports associated with the 6-port E&amp;M Adapter card must be in shutdown mode and no channels can be defined on the card.</p> <p>The signaling type is selectable on a per-card basis depending on companding type. When A-Law companding is configured, the signaling type is automatically type V. When Mu-Law companding is configured, all signaling types can be selected; however, the only supported configurations are both ends of the connection operating in the same mode (for example, Type I to Type I) or one end operating in Type I mode and the other in Type V mode.</p> |
| <b>Default</b>     | type-i (for Mu-Law companding)<br><br>type-v (for A-Law companding)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Parameters</b>  | <b>type-i</b> — Type I signaling<br><b>type-ii</b> — Type II signaling<br><b>type-v</b> — Type V signaling                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

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### 3.13.2.4 Interface QoS Commands

#### access

|                    |                                                                                                            |
|--------------------|------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>access</b>                                                                                              |
| <b>Context</b>     | config>card>mda                                                                                            |
| <b>Description</b> | This command enables the access context to configure QoS policy parameters for the specified adapter card. |

#### network

|                    |                                                                                                             |
|--------------------|-------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>network</b>                                                                                              |
| <b>Context</b>     | config>card>mda                                                                                             |
| <b>Description</b> | This command enables the network context to configure QoS policy parameters for the specified adapter card. |

#### ingress

|                    |                                                                                                                                                                      |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>ingress</b>                                                                                                                                                       |
| <b>Context</b>     | config>card>mda>access<br>config>card>mda>network                                                                                                                    |
| <b>Description</b> | This command enables the context to configure the QoS policy parameters for ingress traffic, in either an access or network context, for the specified adapter card. |

#### fabric-policy

|                    |                                                                                                                                                                                                                                                                                                                 |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>fabric-policy</b> <i>fabric-policy-id</i><br><b>no fabric-policy</b>                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>card>mda>access>ingress<br>config>card>mda>network>ingress                                                                                                                                                                                                                                               |
| <b>Description</b> | <p>This command configures (applies) the ingress fabric policy, in either an access or network context, for the specified adapter card.</p> <p>Fabric profiles do not apply to the Auxiliary Alarm card.</p> <p>The <b>no</b> form of this command resets the <i>fabric-policy-id</i> to the default value.</p> |

---

|                   |                                                        |
|-------------------|--------------------------------------------------------|
| <b>Default</b>    | 1                                                      |
| <b>Parameters</b> | <i>fabric-policy-id</i> — an existing fabric policy ID |
| <b>Values</b>     | 1 to 256                                               |

## queue-policy

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>queue-policy</b> <i>name</i><br><b>no queue-policy</b>                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>card>mda>network>ingress                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b> | This command specifies the network ingress queue policy that defines queue parameters such as CBS, high-priority-only burst size, MBS, CIR, and PIR rates, as well as forwarding class-to-queue mappings. The network queue policy is defined in the <b>config&gt;qos&gt;network-queue</b> context. Refer to the 7705 SAR Quality of Service Guide, “Network Queue QoS Policies”, for more information.<br><br>The <b>no</b> form of this command reverts to the default. |
| <b>Default</b>     | “default”                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Parameters</b>  | <i>name</i> — specifies an existing network queue policy name                                                                                                                                                                                                                                                                                                                                                                                                             |

## security-queue-policy

|                    |                                                                                                                                                                                                                         |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>security-queue-policy</b> <i>policy-id</i><br><b>no security-queue-policy</b>                                                                                                                                        |
| <b>Context</b>     | config>card>mda>access>ingress<br>config>card>mda>network>ingress                                                                                                                                                       |
| <b>Description</b> | This command applies an existing security queue policy, in either an access or network context, to the specified adapter card.<br><br>The <b>no</b> form of this command sets the <i>policy-id</i> back to the default. |
| <b>Default</b>     | 1                                                                                                                                                                                                                       |
| <b>Parameters</b>  | <i>policy-id</i> — specifies an existing security queue policy ID                                                                                                                                                       |
| <b>Values</b>      | 1 to 65535                                                                                                                                                                                                              |

---

## shaper-policy

- Syntax** **shaper-policy** *policy-name*  
**no shaper-policy** *policy-name*
- Context** config>card>mda>access>ingress
- Description** This command enables the context to assign a shaper policy to an Ethernet MDA.
- For access ingress per-customer aggregate shaping, the shaper policy is assigned to an Ethernet MDA and SAPs on that Ethernet MDA must be bound to a shaper group within the shaper policy bound to that Ethernet MDA.
- The default shaper policy cannot be deleted. [Table 24](#) displays the default shaper policy parameters.

**Table 24 Shaper Policy Defaults**

| Field        | Default                      |
|--------------|------------------------------|
| description  | "Default Shaper QoS policy." |
| shaper-group | "default"                    |
| description  | "Default Shaper Group."      |
| pir-rate     | max                          |
| cir-rate     | 0                            |

The **no** form of this command removes the configured **shaper-policy**.

- Default** shaper-policy "default"
- Parameters** *policy-name* — the name of the shaper policy. To access the default shaper policy, enter "default".
- Values** Valid names consist of any string up to 32 characters long composed of printable, 7-bit ASCII characters.
- If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.
- create** — keyword used to create a shaper policy

## ring

- Syntax** ring
- Context** config>card>mda>network

---

**Description** This command specifies the QoS policy parameters for ring traffic in a network, for the 2-port 10GigE (Ethernet) Adapter card or 2-port 10GigE (Ethernet) module.

## add-drop-port-queue-policy

**Syntax** **add-drop-port-queue-policy** *name*  
**no add-drop-port-queue-policy**

**Context** config>card>mda>network>ring

**Description** This command specifies the network queue policy to be applied to the add/drop port on the bridging domain side of a ring adapter card. The network queue policy is defined in the **config>qos>network-queue** context. Refer to the 7705 SAR Quality of Service Guide, “Network Queue QoS Policies”, for more information.

The ring ports and the add/drop port cannot use the same non-default network queue policy that is being used by the v-port and any other port on other cards.

**Default** no add-drop-port-queue-policy

**Parameters** *name* — specifies an existing network queue policy

## qos-policy

**Syntax** **qos-policy** *network-policy-id*  
**no qos-policy**

**Context** config>card>mda>network>ring

**Description** This command specifies the network QoS policy for the ring. Only a ring type network QoS policy can be assigned to a port on the bridging domain side of a ring adapter card.

**Default** no qos-policy

**Parameters** *network-policy-id* — specifies the network QoS policy for the ring ports and the add/drop port on a ring adapter card

## spt

**Syntax** **spt**

**Context** config>card>mda  
 config>system

**Description** This command enables the context for configuring SPT (self-processed traffic) parameters. The **config>card>mda** context is used for the 7705 SAR-8, 7705 SAR-18, and 7705 SAR-X. The **config>system** context is used for the 7705 SAR-Hc, 7705 SAR-H, and 7705 SAR-Wx.



---

**Default**    n/a

security-aggregate-rate

**Syntax**    **security-aggregate-rate** *agg-rate*  
             **no security-aggregate-rate**

**Context**    config>card>mda>spt  
             config>system>spt

**Description**    This command configures the fabric aggregate rate for security queues on the datapath. The command is configured in the **config>card>mda>spt** context for the 7705 SAR-8, 7705 SAR-18, and 7705 SAR-X, and in the **config>system>spt** context for the 7705 SAR-Hc, 7705 SAR-H, and 7705 SAR-Wx.

**Parameters**    *agg-rate* — specifies the aggregate rate for security queues, in kilobits per second

|                |                         |
|----------------|-------------------------|
| <b>Values</b>  | 1 to 10000000   maximum |
| <b>Default</b> | 50000                   |

### 3.13.2.5 External Alarm Commands

#### external-alarms

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>external-alarms</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | config                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Description</b> | <p>This command enables access to the context to configure external alarm attributes on 7705 SAR Ethernet ports (supported on all platforms with Ethernet ports), on the Auxiliary Alarm card, and on the four alarm inputs on the fan module (for the 7705 SAR-8), alarm connector (for the 7705 SAR-M (all variants), 7705 SAR-H, 7705 SAR-Hc, and 7705 SAR-X), and alarm module (for the 7705 SAR-18).</p> <p>When configuring custom alarms for an Ethernet port, the port must be configured for 100Base-Tx operation with autonegotiation disabled.</p> |

#### alarm

|                    |                                                                                                                                                                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] alarm <i>alarm-id</i></b>                                                                                                                                                                                                                  |
| <b>Context</b>     | config>external-alarms                                                                                                                                                                                                                             |
| <b>Description</b> | <p>This command creates or removes alarms.</p> <p>The <b>no</b> form of this command disables the alarm attributes for the specified alarm. The alarm must be in the shutdown state before the <b>no</b> form of the command can be performed.</p> |
| <b>Default</b>     | n/a                                                                                                                                                                                                                                                |
| <b>Parameters</b>  | <p><i>alarm-id</i> — specifies the alarm identifier</p> <p><b>Values</b> 1 to 2147483647</p>                                                                                                                                                       |

#### chassis-alarms

|                    |                                                                                                                                                                                                              |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] chassis-alarms</b>                                                                                                                                                                                   |
| <b>Context</b>     | config>external-alarms>alarm                                                                                                                                                                                 |
| <b>Description</b> | <p>This command generates output to chassis alarm relays and LEDs for the specified alarm.</p> <p>The <b>no</b> form of this command disables the generation of output to chassis alarm relays and LEDs.</p> |
| <b>Default</b>     | chassis-alarms                                                                                                                                                                                               |

---

## log

|                    |                                                                                                                                                                                                                                             |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] log</b>                                                                                                                                                                                                                             |
| <b>Context</b>     | config>external-alarms>alarm                                                                                                                                                                                                                |
| <b>Description</b> | <p>This command generates raise/clear log events for the specified alarm and controls SNMP trap generation for the raise/clear log events.</p> <p>The <b>no</b> form of this command disables the generation of raise/clear log events.</p> |
| <b>Default</b>     | log                                                                                                                                                                                                                                         |

## severity

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>severity {critical   major   minor   warning}</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Context</b>     | config>external-alarms>alarm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | <p>This command configures the severity level for the specified alarm.</p> <p>The alarm must be disabled before the severity level can be modified.</p> <p>If the alarm generates raise/clear log events and SNMP traps (enabled by the <a href="#">log</a> command), the severity of the raise log events and SNMP traps is controlled by this configuration. The severity level of the clear log events and SNMP traps is warning.</p> <p>If the alarm generates output to chassis alarm relays and LEDs (enabled by the <a href="#">chassis-alarming</a> command), the severity level of the alarm output is controlled by this configuration. For chassis relay alarms, only the critical, major and minor levels of severity apply. (There are three LEDs that represent each of them.)</p> |
| <b>Default</b>     | major                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Parameters</b>  | <p><b>critical</b> — specifies a critical alarm</p> <p><b>major</b> — specifies a major alarm</p> <p><b>minor</b> — specifies a minor alarm</p> <p><b>warning</b> — specifies a warning (not applicable for chassis relay alarms)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

## thresholds

|                    |                                                                                       |
|--------------------|---------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>thresholds</b>                                                                     |
| <b>Context</b>     | config>external-alarms>alarm                                                          |
| <b>Description</b> | This command enables the context to configure the thresholds for the specified alarm. |
| <b>Default</b>     | n/a                                                                                   |

## analog

|                    |                                                                                                  |
|--------------------|--------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>analog</b>                                                                                    |
| <b>Context</b>     | config>external-alarms>alarm>thresholds                                                          |
| <b>Description</b> | This command enables the context to configure analog trigger thresholds for the specified alarm. |
| <b>Default</b>     | n/a                                                                                              |

## level

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] level {lt   gt} millivolts</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | config>external-alarms>alarm>thresholds>analog                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | <p>This command configures the analog voltage level thresholds for the specified alarm.</p> <p>The analog input level threshold cannot be changed from <b>no level</b> when there are no analog inputs configured as triggers. When all analog inputs are removed from the trigger list, the level is automatically changed to <b>no level</b>. The analog input level threshold cannot be changed to <b>no level</b> when there is analog input in the trigger list. When the first analog input is added to the alarm trigger, the level is automatically changed to <b>gt 0</b>.</p> <p>The <b>no</b> form of this command removes the analog voltage level threshold.</p> |
| <b>Default</b>     | no level                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Parameters</b>  | <p><b>lt</b> — specifies a less-than value</p> <p><b>gt</b> — specifies a greater-than value</p> <p><i>millivolts</i> — specifies the voltage level in millivolts</p> <p><b>Values</b>      0 to 75000</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

## trigger

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>trigger</b> [ <b>any</b>   <b>all</b> ] { <i>alarm-input1</i>   <i>alarm-input2...</i>   <i>alarm-input8</i> }<br><b>no trigger</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Context</b>     | config>external-alarms>alarm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Description</b> | <p>This command configures the inputs that will trigger the alarm. An alarm can be configured to trigger on any configured input or only when all enabled configured inputs are active. Administratively disabled inputs are ignored for alarm triggering.</p> <p>Digital inputs are considered normally open. This means that a digital input becomes active only if it closes. Analog inputs have a customizable voltage threshold. This threshold can be configured using the <a href="#">thresholds</a> command. Analog inputs become active when this threshold is crossed.</p> <p>The <b>no</b> form of this command removes the trigger.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Default</b>     | no trigger                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Parameters</b>  | <p><b>any</b> — specifies that any configured input trigger will raise an alarm</p> <p><b>all</b> — specifies that all configured input triggers that are enabled are required to raise an alarm</p> <p><i>alarm-input</i> — identifies the input trigger, up to a maximum of eight</p> <p>for Ethernet ports, the format is:</p> <p><b>port-slot/mda/port</b> [<i>name</i>]</p> <p>for the Auxiliary Alarm card, the format is:</p> <p><b>alarm-slot/mda.{d   a}-alarm-num</b> [<i>name</i>]</p> <p>for the four alarm inputs on the fan module (for the 7705 SAR-8), alarm connector (for the 7705 SAR-M (all variants), 7705 SAR-H, 7705 SAR-Hc, and 7705 SAR-X), and alarm module (for the 7705 SAR-18), the format is:</p> <p><b>alarm.d-alarm-num</b> [<i>name</i>]</p> <p>where:</p> <p><i>slot</i> = card slot number for IOM (always 1 on the 7705 SAR)</p> <p><i>mda</i> = Ethernet adapter card or Auxiliary Alarm card slot number (for Ethernet modules or ports on platforms with no card slots, the mda slot number is preconfigured)</p> <p><i>port</i> = port number for Ethernet ports</p> <p><b>d</b> = digital input</p> <p><b>a</b> = analog input</p> <p><i>alarm-num</i> = alarm port number (1 to 24 for digital on the Auxiliary Alarm card, 1 to 4 for digital on the four chassis alarm inputs, 1 or 2 for analog)</p> <p><i>name</i> = optional name assigned to the input</p> <p>for example:</p> <p>alarm-1/3.d-3</p> |

windowOpen3

alarm.d-1

The *name* option lets users assign a more meaningful name (must be unique) to the alarm input; for example, windowOpen3 might be more meaningful to a user than the identifier alarm-1/3.d-3. Once the *name* has been configured, it can be used interchangeably with the alarm input identifier; for example, windowOpen3 can be used instead of alarm-1/3.d-3 as an alarm input trigger.

## input

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>input</b> <i>alarm-input</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Context</b>     | config>external-alarms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b> | <p>This command enables the context to configure the external alarm inputs on 7705 SAR Ethernet ports, on the Auxiliary Alarm card, and on the four alarm inputs on the fan module (for the 7705 SAR-8), alarm connector (for the 7705 SAR-M (all variants), 7705 SAR-H, 7705 SAR-Hc, and 7705 SAR-X), and alarm module (for the 7705 SAR-18).</p> <p>An alarm input must be associated with an alarm in order for the input to be triggered. See the <a href="#">trigger</a> command. An input can be associated with up to four alarms.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Default</b>     | n/a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Parameters</b>  | <p><i>alarm-input</i> — identifies the alarm input</p> <p>for Ethernet ports, the format is:</p> <p><b>port-slot/mda/port</b> [<i>name</i>]</p> <p>for the Auxiliary Alarm card, the format is:</p> <p><b>alarm-slot/mda.{d   a}-alarm-num</b> [<i>name</i>]</p> <p>for the four alarm inputs on the fan module (for the 7705 SAR-8), alarm connector (for the 7705 SAR-M (all variants), 7705 SAR-H, 7705 SAR-Hc, and 7705 SAR-X), and alarm module (for the 7705 SAR-18), the format is:</p> <p><b>alarm.d-alarm-num</b> [<i>name</i>]</p> <p>where:</p> <p><i>slot</i> = card slot number for IOM (always 1 on the 7705 SAR)</p> <p><i>mda</i> = Ethernet adapter card or Auxiliary Alarm card slot number (for Ethernet modules or ports on platforms with no card slots, the mda slot number is preconfigured)</p> <p><i>port</i> = port number for Ethernet ports</p> <p><b>d</b> = digital input</p> <p><b>a</b> = analog input</p> <p><i>alarm-num</i> = alarm port number (1 to 24 for digital on the Auxiliary Alarm card, 1 to 4 for digital on the four chassis alarm inputs, 1 or 2 for analog)</p> <p><i>name</i> = optional name assigned to the input</p> |

for example:

alarm-1/3.d-3  
windowOpen3  
alarm.d-1

The *name* option lets users assign a more meaningful name (must be unique) to the alarm input; for example, windowOpen3 might be more meaningful to a user than the identifier alarm-1/3.d-3. Once the *name* has been configured, it can be used interchangeably with the alarm input identifier; for example, windowOpen3 can be used instead of alarm-1/3.d-3 as an alarm input trigger for the [trigger](#) command, or when performing a **show>external-alarms>input** or **show>external-alarms>output** command.

## debounce

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>debounce</b> <i>seconds</i><br><b>debounce detect</b> <i>detect-seconds</i> <b>clear</b> <i>clear-seconds</i><br><b>no debounce</b>                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Context</b>     | config>external-alarms>input                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b> | <p>This command configures the debounce time associated with detecting and clearing an alarm input. Debounce time is not supported on alarm inputs on Ethernet ports.</p> <p>The <b>no debounce</b> form of the command sets both the detect time and clear time to 0.</p>                                                                                                                                                                                                                                        |
| <b>Default</b>     | 2 (for both detect time and clear time)                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Parameters</b>  | <p><i>seconds</i> — specifies the amount of time that the input must be on or off before it is accepted as changed from on to off (or from off to on)</p> <p><b>Values</b> 1 to 60</p> <p><i>detect-seconds</i> — specifies the amount of time that the input must be on before it is accepted as on by the system</p> <p><b>Values</b> 0 to 60</p> <p><i>clear-seconds</i> — specifies the amount of time that the input must be off before it is accepted as off by the system</p> <p><b>Values</b> 0 to 60</p> |

## output

|                    |                                                                                 |
|--------------------|---------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>output</b> <i>alarm-output</i>                                               |
| <b>Context</b>     | config>external-alarms                                                          |
| <b>Description</b> | This command enables the context to configure the external alarm output relays. |
| <b>Default</b>     | n/a                                                                             |

---

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Parameters</b> | <p><i>alarm-output</i> — identifies the output relay, in the following format:</p> <p><b>relay-slot/mda.d-relay-num</b> [<i>name</i>]</p> <p>where:</p> <p><i>slot</i> = slot number of the card in the chassis (always 1 on the 7705 SAR)</p> <p><i>mda</i> = Auxiliary Alarm card slot number</p> <p><b>d</b> = digital output</p> <p><i>relay-num</i> = output relay number (1 to 8)</p> <p><i>name</i> = name assigned to the output relay</p> <p>for example:</p> <p>relay-1/3.d-5</p> <p>doorHolder5</p> <p>The <i>name</i> option lets users assign a more meaningful name (must be unique) to the output relay; for example, doorHolder5 might be more meaningful to a user than the output relay identifier relay-1/3.d-5. Once the name has been configured, it can be used interchangeably with the alarm identifier; for example, doorHolder5 can be used instead of relay-1/3.d-5 when performing a <b>show&gt;external-alarms&gt;output</b> command.</p> |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

name

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <p><b>name</b> <i>name-string</i></p> <p><b>no name</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | <p>config&gt;external-alarms&gt;input</p> <p>config&gt;external-alarms&gt;output</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | <p>This command configures a name for the alarm input or output relay. The configured name must be unique within the external alarms context; therefore, it must not be the same as an <i>alarm-input</i> name configured for the <a href="#">trigger</a> or <a href="#">input</a> command, or an <i>alarm-output</i> name configured for the <a href="#">output</a> command. For example, alarm-1/3.d-1 or doorOpen1 cannot be used as a name for any alarm input, and relay-1/3.d-5 or doorHolder5 cannot be used as a name for any output relay.</p> <p>The <b>no</b> form of this command does not associate a name with the alarm input or output relay.</p> |
| <b>Default</b>     | <p>no name</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Parameters</b>  | <p><i>name-string</i> — specifies a unique name for the alarm input or output relay (maximum of 15 characters)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |



## normally

|                    |                                                                                                                                                                                           |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>normally {open   closed}</b>                                                                                                                                                           |
| <b>Context</b>     | config>external-alarms>input                                                                                                                                                              |
| <b>Description</b> | This command configures the normal condition of the digital input – either normally open or normally closed. You cannot configure the normal condition on alarm inputs on Ethernet ports. |
| <b>Default</b>     | normally open                                                                                                                                                                             |

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### 3.13.2.6 APS Port Commands

#### port

|                    |                                                                                                                                                                                                                                                                             |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] port {aps-id}</b>                                                                                                                                                                                                                                                   |
| <b>Context</b>     | config                                                                                                                                                                                                                                                                      |
| <b>Description</b> | This command enables access to the context to configure APS on SONET/SDH ports and assigns an APS group ID. Both working and protection circuits must be configured with the same APS group ID on either the same 7705 SAR node (SC-APS) or on two 7705 SAR nodes (MC-APS). |
| <b>Parameters</b>  | <b>aps</b> — keyword<br><i>id</i> — 1 to 8                                                                                                                                                                                                                                  |

#### aps

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>aps</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Context</b>     | config>port                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b> | <p>This command configures APS on SONET/SDH ports. An APS group contains a working and protection circuit with the same APS group ID on either a single 7705 SAR node (SC-APS) or on two 7705 SAR nodes (MC-APS).</p> <p>The working circuit must be connected to the peer working circuit, and the protection circuit must be connected to the peer protection circuit.</p> <p>The <b>aps</b> command is only available for APS groups, not for physical ports.</p> |

#### advertise-interval

|                    |                                                                                                                                                                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>advertise-interval</b> <i>advertise-interval</i><br><b>no advertise-interval</b>                                                                                                                                                                       |
| <b>Context</b>     | config>port>aps                                                                                                                                                                                                                                           |
| <b>Description</b> | This command specifies the time interval, in 100s of milliseconds, between “I am operational” messages sent by the protection and working circuits to their neighbor in an MC-APS group. The <b>advertise-interval</b> value is valid only for an MC-APS. |
| <b>Default</b>     | 10                                                                                                                                                                                                                                                        |

---

**Parameters**    *advertise-interval* — the time interval, in 100s of milliseconds, between transmitted operational messages

**Values**        10 to 650

## hold-time

**Syntax**        **hold-time** *hold-time*  
**no hold-time**

**Context**        config>port>aps

**Description**    This command specifies how much time can pass without the node receiving an advertise packet from its neighbor before the MC-APS signaling link is considered operationally down.

The hold time is in 100s of milliseconds and is usually the [advertise-interval](#) value multiplied by 3.

**Parameters**    *hold-time* — specifies, in 100s of milliseconds, how long to wait for an APS advertise packet before the neighbor in an MC-APS group is considered operationally down.

**Values**        10 to 650

## hold-time-aps

**Syntax**        **hold-time-aps** {[*signal-fail sf-time*] [*signal-degrade sd-time*]}  
**no hold-time-aps**

**Context**        config>port>aps

**Description**    This command configures hold-down timers to debounce signal failure conditions (lais, b2err-sf) and signal degrade conditions (b2err-sd) for 1+1 unidirectional SC-APS switching mode. If the signal fail or signal degrade conditions exceed the configured hold-down time, APS is activated.

**Default**        no hold-time-aps (values are 0)

**Parameters**    *sf-time* — the signal failure hold-down time in milliseconds, from 1 to 100

*sd-time* — the signal degrade hold-down time in milliseconds, from 1 to 100

## neighbor

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>neighbor</b> <i>ip-address</i><br><b>no neighbor</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Context</b>     | config>port>aps                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b> | <p>This command specifies the neighbor's IP address in an MC-APS group. When the value of the neighbor IP address is set to 0.0.0.0, or not set, this implies that the APS group is configured as an SC-APS group.</p> <p>The route to the neighbor must not traverse the MC-APS member (working or protection) circuits. It is recommended that the neighbor IP address configured be on a shared network between the routers that own the working and protection circuits. The node should be connected with a direct interface to ensure optimum failover time.</p> <p>By default, no neighbor address is configured and both the working and protection circuits should be configured on the same router as an SC-APS group.</p> |
| <b>Default</b>     | 0.0.0.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Parameters</b>  | <i>ip-address</i> — specifies the neighbor's IP address for MC-APS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Values</b>      | <p><i>ipv4-address:</i> a.b.c.d</p> <p><i>ipv6-address:</i> x:x:x:x:x:x:x (eight 16-bit pieces)</p> <p>x:x:x:x:x:d.d.d.d</p> <p>x: [0 to FFFF]H</p> <p>d: [0 to 255]D</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

## protect-circuit

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>protect-circuit</b> <i>port-id</i><br><b>no protect-circuit</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | config>port>aps                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | <p>This command configures a physical port that will act as the protection circuit for this APS group.</p> <p>The protection circuit port must contain only the default configuration and cannot belong to another APS group. The protection circuit port must be of the same type as the working circuit (SONET/SDH) for the APS group; if it is not, the command will return an error.</p> <p>A protection circuit can only be added if the working circuit already exists. The protection circuit must be removed from the configuration before the working circuit can be removed.</p> <p>When a port is a protection circuit of an APS group, the configuration options available in the <b>config&gt;port port-id&gt;sonet-sdh</b> context are not allowed for that port unless they are in the following exception list:</p> |

- clock-source
- [no] loopback
- [no] report-alarm
- section-trace
- [no] threshold

When a port is configured as a protection circuit of an APS group, the configurations listed above and all service configurations related to the APS port are operationally inherited by the protection circuit. If the protection circuit cannot inherit the configurations (due to resource limitations), the configuration attempt fails and an error is returned to the user.

The protection circuit must be shut down before it can be removed from the APS group port. The inherited configuration for the circuit and APS operational commands for that circuit are not preserved when the circuit is removed from the APS group.

The **no** form of this command removes the protection circuit.

|                   |                                                                                                                                  |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | n/a                                                                                                                              |
| <b>Parameters</b> | <i>port-id</i> — the physical port that will act as the protection circuit for this APS group in the format <i>slot/mda/port</i> |

## rdi-alarms

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] rdi-alarms {suppress   circuit}</b>                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Context</b>     | config>port>aps                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | This command configures how RDI alarms (line, path, section) are generated on physical circuits of an APS port. The command is only supported in 1+1 unidirectional SC-APS mode. When you configure RDI alarms on a port on the 2-port OC3/STM1 Channelized Adapter card, the second port is automatically configured with a matching RDI alarms setting. As a consequence, both ports will then support only 1+1 unidirectional SC-APS mode. |
| <b>Default</b>     | circuit                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Parameters</b>  | <p><b>suppress</b> — RDI hardware generation on working and protection circuits is suppressed. No alarms are generated upon an Rx failure of that circuit.</p> <p><b>circuit</b> — RDI alarms are hardware-generated independently on each working and protection circuit based on an Rx failure of that circuit, regardless of APS line status</p>                                                                                           |

## revert-time

|               |                                                            |
|---------------|------------------------------------------------------------|
| <b>Syntax</b> | <b>revert-time</b> <i>minutes</i><br><b>no revert-time</b> |
|---------------|------------------------------------------------------------|

---

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Context</b>     | config>port>aps                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | <p>This command configures how long the 7705 SAR waits before switching back to the working circuit after it has been restored to service.</p> <p>If the minutes value is changed, it takes effect at the next initiation of the wait-to-restore (WTR) timer.</p> <p>This command does not modify the length of a WTR timer that has already been started. The WTR timer of a non-revertive switch can be assumed to be infinite.</p> <p>The <b>no</b> form of this command restores the default (non-revertive) mode – the switch back does not occur unless the protection circuit fails or it is manually switched by the operator.</p> |
| <b>Parameters</b>  | <p><i>minutes</i> — the time to wait, in minutes, before reverting back to the working circuit after it has been restored to service</p> <p><b>Values</b>      0 to 60</p> <p><b>Default</b>      5</p>                                                                                                                                                                                                                                                                                                                                                                                                                                    |

## switching-mode

|                    |                                                                                                                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>switching mode {bi-directional   uni-1plus1}</b>                                                                                                                                        |
| <b>Context</b>     | config>port>aps                                                                                                                                                                            |
| <b>Description</b> | This command configures the switching mode for the APS port. SC-APS supports both <b>bi-directional</b> and <b>uni-1plus1</b> ; MC-APS supports only <b>bi-directional</b> switching mode. |
| <b>Default</b>     | bi-directional                                                                                                                                                                             |
| <b>Parameters</b>  | <p><b>bi-directional</b> — provides protection in both directions</p> <p><b>uni-1plus1</b> — provides protection in one direction</p>                                                      |

## working-circuit

|                    |                                                                                                                                                                                                                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>working-circuit <i>port-id</i></b><br><b>no working-circuit</b>                                                                                                                                                                                                                              |
| <b>Context</b>     | config>port>aps                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | <p>This command configures a physical port that will act as the working circuit for this APS group.</p> <p>The working circuit port must contain only the default configuration and cannot be part of another APS group. The working circuit must be created before the protection circuit.</p> |

---

When a port is a working circuit of an APS group, the configuration options available in the **config>port port-id>sonet-sdh** context are not allowed for that port unless they are in the following exception list:

- clock-source
- [no] loopback
- [no] report-alarm
- section-trace
- [no] threshold

When a port is configured as a working circuit of an APS group, the configurations listed above and all service configurations related to the APS port are operationally inherited by the working circuit from the APS group ID. If the working circuit cannot inherit that configuration (for example, due to resource limitations), the configuration attempt fails and an error is returned to the user.

The working circuit must be shut down before it can be removed from an APS group. The inherited configuration for the circuit and APS operational commands for that circuit are not preserved when the circuit is removed from the APS group.

All configurations for the APS group under the **config>port** context and its submenus and all configuration for services that use this APS group ID are preserved as a non-activated configuration since the APS group no longer has any physical circuits assigned.

The **no** form of this command removes the working circuit. The working circuit can only be removed from the configuration after the protection circuit has been removed.

**Parameters**     *port-id* — the physical port that will act as the working circuit for this APS group in the format *slot/mda/port*

### 3.13.2.7 Microwave Link Commands

#### port

|                    |                                                                                                                                                             |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] port</b> <i>mw-link-id</i>                                                                                                                          |
| <b>Context</b>     | config                                                                                                                                                      |
| <b>Description</b> | This command configure a microwave link on a 7705 SAR-8 or 7705 SAR-18.<br><br>The <b>no</b> form of this command removes the microwave link configuration. |
| <b>Parameters</b>  | <i>mw-link-id</i> — specifies the microwave link ID number, using the form <b>mw-link-id</b><br><br><b>Values</b> <i>id</i> = 1 to 24                       |

#### mw

|                    |                                                                          |
|--------------------|--------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mw</b>                                                                |
| <b>Context</b>     | config>port                                                              |
| <b>Description</b> | This command enables the context to configure microwave link parameters. |

#### hold-time

|                    |                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] hold-time</b> {[ <b>up</b> <i>hold-time-up</i> ] [ <b>down</b> <i>hold-time-down</i> ]}                                                                                                                                                                                                                                   |
| <b>Context</b>     | config>port>mw                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b> | This command configures dampening timers on a microwave link. Dampening timers guard against excessive link transitions reported to upper layer protocols.<br><br>The <b>no</b> form of this command removes the dampening timers configuration.                                                                                  |
| <b>Default</b>     | down 0 or up 0 — no microwave link dampening is enabled; link transitions are immediately reported to upper layer protocols                                                                                                                                                                                                       |
| <b>Parameters</b>  | <i>hold-time-up</i> — the number of seconds before an up-state to down-state transition is reported to upper layer protocols<br><br><b>Values</b> 0 to 900 s<br><br><i>hold-time-down</i> — the number of seconds before a down-state to up-state transition is reported to upper layer protocols<br><br><b>Values</b> 0 to 900 s |



---


## peer-discovery

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] peer-discovery</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>port>mw                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | <p>This command enables or disables peer discovery on the microwave link.</p> <p>Peer discovery is used to discover the IP addresses of remote routers over the microwave link, as well as the physical ports of the remote routers corresponding to the primary radios for the microwave link.</p> <p>Ports with peer discovery disabled do not send peer discovery packets and ignore any received peer discovery packets. The CLI does not display the IP address of peers when peer discovery is disabled.</p> |

## protection

|                    |                                                                                                                                                                       |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] protection</b>                                                                                                                                                |
| <b>Context</b>     | config>port>mw                                                                                                                                                        |
| <b>Description</b> | <p>This command enables protection switching on a microwave link.</p> <p>The <b>no</b> form of this command removes the protection switching on a microwave link.</p> |

## radio

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>radio <i>port-id</i> create [main   spare]</b><br><b>no radio <i>port-id</i></b>                                                                                                                                                                                                                                                                                                                                                                |
| <b>Context</b>     | config>port>mw                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | <p>This command configures an MPR-e radio for a microwave link.</p> <p>The <b>no</b> form of this command removes an MPR-e spare radio from the specified port</p> <p> <b>Note:</b> You cannot remove an MPR-e main radio that is associated with a microwave link. The microwave link must be deleted and then re-configured with the desired MPR-e radio.</p> |
| <b>Parameters</b>  | <i>port-id</i> — specifies a port on a Packet Microwave Adapter card on which an MPR-e radio is configured, in the format <i>slot/mda/port</i> ( <i>port</i> = 1 through 4)                                                                                                                                                                                                                                                                        |

**Note:**

- The port must have an **encap-type** of dot1q and it cannot be used by any service or interface.
- Only a main radio can be configured on an odd-numbered port, that is, port 1 or 3.

**create** — creates the MPR-e radio (mandatory)

**main** — sets the MPR-e radio as the main (active) radio

**spare** — sets the MPR-e radio as the spare (standby) radio

## database

|                    |                                                                                                                                                             |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] database</b> <i>filename</i>                                                                                                                        |
| <b>Context</b>     | config>port>mw>radio                                                                                                                                        |
| <b>Description</b> | This command configures the filename of the MPR-e radio database.<br><br>The <b>no</b> form of this command removes the MPR-e radio database configuration. |
| <b>Default</b>     | n/a                                                                                                                                                         |
| <b>Parameters</b>  | <i>filename</i> — specifies the name of the MPR-e radio database<br><b>Values</b> up to 32 characters                                                       |

## name

|                    |                                                                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] name</b> <i>name-string</i>                                                                                                                            |
| <b>Context</b>     | config>port>mw>radio                                                                                                                                           |
| <b>Description</b> | This command specifies a name to be associated with an MPR-e radio.<br><br>The <b>no</b> form of this command removes the name configured for the MPR-e radio. |
| <b>Default</b>     | n/a                                                                                                                                                            |
| <b>Parameters</b>  | <i>name-string</i> — specifies the MPR-e radio name<br><b>Values</b> up to 32 characters                                                                       |

## rsl-history

|                    |                                                                                                                                                                                         |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>rsl-history</b> <i>file-url</i><br><b>no rsl-history</b>                                                                                                                             |
| <b>Context</b>     | config>port>mw>radio                                                                                                                                                                    |
| <b>Description</b> | This command enables the RSL history file for an MPR-e radio to be uploaded to the 7705 SAR.<br><br>The <b>no</b> form of this command removes the configuration.                       |
| <b>Default</b>     | no rsl-history                                                                                                                                                                          |
| <b>Parameters</b>  | <i>file-url</i> — specifies the URL of the RSL history file for the specified radio<br><b>Values</b> <i>local-urt:</i> [ <i>cflash-id</i> ]/[ <i>file-path</i> ]; 99 characters maximum |

## standalone

|                    |                                                                                                                                                                                           |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] standalone</b>                                                                                                                                                                    |
| <b>Context</b>     | config>port>mw>radio                                                                                                                                                                      |
| <b>Description</b> | This command configures the MPR-e radio to operate in standalone mode.<br><br>The <b>no</b> form of this command removes the standalone designation and sets the MPR-e radio in MWA mode. |
| <b>Default</b>     | no standalone                                                                                                                                                                             |

## suppress-faults

|                    |                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>suppress-faults</b> [ <b>hber</b> ] [ <b>rsl-threshold</b> ] [ <b>rdi</b> ] [ <b>all</b> ]<br><b>[no] suppress-faults</b>                                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>port>mw>radio                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | This command suppresses detected faults on microwave links. If microwave link faults are detected, an event is logged and the link is disabled. When faults are suppressed, the event is still logged, but the microwave link is not disabled. By default, the system does not suppress faults for FFD.<br><br>The <b>no</b> form of this command removes fault suppression. |
| <b>Default</b>     | no suppress-faults                                                                                                                                                                                                                                                                                                                                                           |
| <b>Parameters</b>  | <b>hber</b> — suppresses High Bit Error Rate faults<br><b>rsl-threshold</b> — suppresses RSL threshold crossing faults                                                                                                                                                                                                                                                       |

**rdi** — suppresses RDI faults

**all** — suppresses all faults

## tx-mute

**Syntax** [no] tx-mute

**Context** config>port>mw>radio

**Description** This command mutes the transmitter on the radio MPR-e radio.  
The **no** form of this command disables the mute configuration.

## revert

**Syntax** [no] revert [eps] [rps]

**Context** config>port>mw

**Description** This command configures the type of revertive switching on the microwave link. Revertive switching occurs when the MPR-e radio operation switches from the spare radio back to the main radio after a fault condition is cleared.  
The **no** form of this command removes the revertive switching configuration.

**Default** n/a

**Parameters** **eps** — sets Equipment Protection Switching as the revertive switching type



**Note:** If EPS is configured as the revertive switching type, Transmission Protection Switching (TPS) is automatically applied as well; TPS cannot be enabled independently.

**rps** — sets Radio Protection Switching as the revertive switching type

### 3.13.2.8 General Port Commands

#### port

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>port</b> { <i>port-id</i>   <i>bundle-id</i> }<br><b>no port</b> { <i>port-id</i>   <i>bundle-id</i> }                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Context</b>     | config                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | This command enables access to the context to configure ports, multilink bundles, and IMA groups. Before a port can be configured, the chassis slot must be provisioned with a valid card type and the adapter card slot must be provisioned with a valid adapter card type. (See the <a href="#">card</a> and <a href="#">mda</a> commands.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Default</b>     | n/a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Parameters</b>  | <p><i>port-id</i> — specifies the physical port ID in the <i>slot/mda/port</i> format, or a virtual port (v-port) on the 2-port 10GigE (Ethernet) Adapter card or 2-port 10GigE (Ethernet) module (where <i>port-id</i> for the virtual port is either “v-port” or 3)</p> <p><i>bundle-id</i> — specifies the multilink bundle identifier</p> <p>The command syntax must be configured as follows:</p> <p><b>Syntax</b>    <i>bundle-type-slot/mda.bundle-num</i><br/> <b>bundle[-ppp]-slot/mda.bundle-num</b> (Creates a multilink PPP bundle)<br/> <b>bundle-ima-slot/mda.bundle-num</b> (Creates an IMA group)<br/> <b>bundle:</b> keyword<br/> <i>slot:</i> card/adapter card slot numbers<br/> <i>bundle-num:</i> 1 to 32<br/> For example:<br/> router1&gt;config# port bundle-1/1.1 (multilink PPP bundle)<br/> router1&gt;config# port bundle-ima-1/1.2 (IMA group bundle)</p> |

#### ddm-events

|                    |                                                                                                                                                                     |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] ddm-events</b>                                                                                                                                              |
| <b>Context</b>     | config>port                                                                                                                                                         |
| <b>Description</b> | This command enables or disables digital diagnostic monitoring (DDM) events for the port. DDM is supported on Ethernet SFP ports, OC3 SONET SFP ports, and v-ports. |
| <b>Default</b>     | no ddm-events                                                                                                                                                       |

dwdm

|                    |                                                                                       |
|--------------------|---------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>dwdm</b>                                                                           |
| <b>Context</b>     | config>port                                                                           |
| <b>Description</b> | This command configures the Dense Wavelength Division Multiplexing (DWDM) parameters. |

channel

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |               |                                                                                                        |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>channel</b> <i>channel</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |               |                                                                                                        |
| <b>Context</b>     | config>port>dwdm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |               |                                                                                                        |
| <b>Description</b> | <p>This command configures the DWDM ITU channel for a tunable adapter card optical interface. The channel is expressed in a form that is derived from the laser's operational frequency. For example, 193.40 THz corresponds to DWDM ITU channel 34 in the 100 GHz grid and 193.45 THz corresponds to DWDM ITU channel 345 in the 50 GHz grid. The provisioned adapter card type must have DWDM tunable optics (2-port 10GigE (Ethernet) Adapter card or 2-port 10GigE (Ethernet) module).</p> <p>The DWDM channel must be set to a non-zero value before the port is set to <b>no shutdown</b>.</p> <p>The port must be shut down before changing the DWDM channel, and the port must be a physical port to set the DWDM channel.</p> |               |                                                                                                        |
| <b>Parameters</b>  | <p><i>channel</i> — specifies the channel</p> <table><tr><td><b>Values</b></td><td>0: valid on disabled ports<br/>17 to 61 inclusive: 100 GHz channels<br/>175, 185 to 605: 50 GHz channels</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Values</b> | 0: valid on disabled ports<br>17 to 61 inclusive: 100 GHz channels<br>175, 185 to 605: 50 GHz channels |
| <b>Values</b>      | 0: valid on disabled ports<br>17 to 61 inclusive: 100 GHz channels<br>175, 185 to 605: 50 GHz channels                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |               |                                                                                                        |

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### 3.13.2.9 Ethernet Commands

#### ethernet

|                    |                                                                                                                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>ethernet</b>                                                                                                                                                                                                                                          |
| <b>Context</b>     | config>port                                                                                                                                                                                                                                              |
| <b>Description</b> | This command enables access to the context to configure Ethernet port attributes on all cards, modules, and chassis that support Ethernet. For the Packet Microwave Adapter card, this command does not apply to ports that support microwave awareness. |

#### access

|                    |                                                                                 |
|--------------------|---------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>access</b>                                                                   |
| <b>Context</b>     | config>port>ethernet                                                            |
| <b>Description</b> | This command enables access to the context to configure access mode parameters. |

#### egress

|                    |                                                                                                                                                                            |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>egress</b>                                                                                                                                                              |
| <b>Context</b>     | config>port>ethernet>access                                                                                                                                                |
| <b>Description</b> | This command enables access to the context to configure the CIR rate for the aggregate of all the unshaped 4-priority SAPs on the port and to configure the shaper policy. |

#### shaper-policy

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>shaper-policy</b> <i>name</i><br><b>no shaper-policy</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | config>port>ethernet>access>egress                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b> | <p>This command assigns a shaper policy to the specified hybrid port.</p> <p>For hybrid ports, the shaper policy is independently assigned to access or network egress traffic. When the Ethernet port mode is changed to hybrid mode, the default policy is assigned to access and network traffic. To change an access or network policy, use the commands <b>config&gt;port&gt;ethernet&gt;access&gt;egress&gt;shaper-policy</b> and <b>config&gt;port&gt;ethernet&gt;network&gt;egress&gt;shaper-policy</b>.</p> |

For access egress per-customer aggregate shaping, the shaper policy is assigned to a port and SAPs on that port must be bound to a shaper group within the shaper policy bound to that port.

The shaper policy defines shaper parameters such as shaper group, and PIR and CIR rates. The shaper policy is defined in the **config>qos>shaper-policy** context. Refer to the 7705 SAR Quality of Service Guide, “QoS for Hybrid Ports” and “Per-Customer Aggregate shapers (Multiservice Site)”, for more information.



**Note:**

- The port shaper rate applies to the bulk of access and network traffic. Thus, once the configured egress shaper rate is reached, both the access and network traffic scheduling pauses.
- For hybrid ports, there can be a single shaper policy on access egress and a single shaper policy on network egress. Therefore, all the SAP traffic and all the network traffic is each bound to its own shaper group in the shaper policy (access and network shaper policy, respectively). In other words, shaped SAPs and the bulk/aggregate of unshaped SAPs are shaped together as per the shaper policy assigned to the access egress. A similar behavior applies to network traffic, where the shaped interfaces and the bulk/aggregate of unshaped interfaces are shaped together as per the shaper policy assigned to the network egress.

The **no** form of this command reverts to the default.

**Default** “default”

**Parameters** *name* — specifies an existing shaper policy name

## unshaped-sap-cir

**Syntax** **unshaped-sap-cir** *cir-rate*  
**no unshaped-sap-cir**

**Context** config>port>ethernet>access>egress

**Description** This command sets the CIR rate for the aggregate of all the unshaped 4-priority SAPs on the port. The default *cir-rate* is 0 kb/s. When the *cir-rate* is set to **max**, the CIR rate adopts the maximum rate of the port, which is set using the [egress-rate sub-rate](#) command.

If the *cir-rate* is higher than the *sub-rate*, the *cir-rate* is stored in the configuration database but the *sub-rate* limit is used.

On a Gen-3-based port, this command can be set for mix-and-match LAG SAP purposes, but is not applied to the Gen-3-based port. See [LAG Support on Mixed-Generation Hardware](#) for more information.

The **no** form of the command sets the **unshaped-sap-cir** CIR rate to 0 kb/s.



---

|                   |                                                                                                  |
|-------------------|--------------------------------------------------------------------------------------------------|
| <b>Default</b>    | no unshaped-sap-cir                                                                              |
| <b>Parameters</b> | <i>cir-rate</i> — the CIR rate for the aggregate of all the unshaped 4-priority SAPs on the port |
| <b>Values</b>     | 0 to 1000000000 kb/s, or max                                                                     |
| <b>Default</b>    | 0 kb/s                                                                                           |

## autonegotiate

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>autonegotiate [limited]</b><br><b>no autonegotiate</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | config>port>ethernet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | <p>For the 8-port Ethernet Adapter card, this command enables speed autonegotiation and duplex autonegotiation on Ethernet 10/100Base-T RJ-45 ports. The command enables speed autonegotiation on the two SFP ports (10, 100, or 1000 Mb/s). Duplex autonegotiation is only supported on SFP ports using 100 Mb/s fiber SFPs or 10/100/1000Base-T copper SFPs. Duplex autonegotiation is not supported on optical Gigabit Ethernet SFPs; the mode is always full duplex.</p> <p>The 8-port Gigabit Ethernet Adapter card, 10-port 1GigE/1-port 10GigE X-Adapter card in <b>x10-1gb-sfp</b> mode, and Packet Microwave Adapter card support speed autonegotiation and duplex autonegotiation on all SFP ports. Each port can run in full-duplex mode or in half-duplex mode at 10 or 100 Mb/s.</p> <p>The 6-port Ethernet 10Gbps Adapter card and the 7705 SAR-X support speed autonegotiation and duplex autonegotiation on all SFP ports; SFP+ ports do not support autonegotiation. Each SFP port can run in full-duplex mode or half-duplex mode at 10 Mb/s or 100 Mb/s, and in full-duplex mode at 1 Gb/s. Each SFP+ port can run in full-duplex mode at 10 Gb/s.</p> <p>Speed autonegotiation takes place automatically — all ports are configured for speed autonegotiation by default. Speed autonegotiation might need to be disabled (for example, if a port must be forced to a certain speed or to avoid speed negotiation loops between the Ethernet Adapter card and other devices). To turn off speed autonegotiation for a port, the user configures the port speed manually.</p> <p>When autonegotiation is disabled on a port, the port does not attempt to autonegotiate and will only operate at the speed and duplex settings configured for the port. Also, when autonegotiation is disabled, the tx and rx pauses are enabled automatically (the tx and rx pauses are negotiated with the far end if autonegotiation is enabled).</p> <p>If the <b>autonegotiate limited</b> keyword option is specified, the port will autonegotiate but will only advertise a specific speed and duplex mode. The speed and duplex mode advertised are the settings configured for the port. One use for limited mode is for multispeed gigabit ports to force gigabit operation while keeping autonegotiation enabled for compliance with IEEE 801.3.</p> |

The **no** form of this command disables autonegotiation on this port.



**Caution:**

- Autonegotiation must not be disabled on an Ethernet port if the port is connected to an MPR-e radio.
- For fiber SFP-based Gigabit Ethernet ports, it is recommended that autonegotiation be enabled. If autonegotiation is disabled and the configured speed does not correctly match the capability of the SFP, then the operational state of the link will remain down. Attempting to configure a speed and duplex mode to 1000 Mb/s, half-duplex, is an invalid combination and will be blocked from CLI.
- For RJ-45 interfaces, autonegotiation is mandatory for 1000Base-T operation (if disabled, the behavior is undefined).



**Note:**

- If autonegotiation is turned off, the reception and transmission of IEEE 802.3x flow control frames is enabled by default and cannot be disabled. For more information, see [Flow Control on Ethernet Ports](#).
- Ports belonging to a microwave link must have limited autonegotiation enabled before the link can be added to a LAG.

**Default**     autonegotiate

cfm-loopback

**Syntax**     **cfm-loopback priority {low | high | dot1p} [match-vlan {vlan-range | none}]**  
**no cfm-loopback**

**Context**     config>port>ethernet  
              config>port>dsl  
              config>port>gpon

**Description**     This command enables the port to respond to LBM messages and sets the queuing and scheduling conditions for handling CFM LBM frames. The user selects the desired QoS treatment by enabling the CFM loopback and including the high or low priority with the **high** or **low** keyword. The queue parameters and scheduler mappings associated with the **high** and **low** keywords are preconfigured and cannot be altered by the user.

The **priority dot1p** and **match-vlan** keywords apply only to physical ring ports on the 2-port 10GigE (Ethernet) Adapter card and 2-port 10GigE (Ethernet) module.

The parameters and mappings have the following settings:

- for network egress, where profiled scheduling is the choice of scheduling:

- **high-priority**: either `cir = port_speed`, which applies to all frames that are scheduled via an in-profile scheduler, or round-robin (RR) for all other (network egress queue) frames that are in-profile
- **low-priority**: either `cir = 0`, `pir = port_speed`, which applies to all frames that are scheduled as out-of-profile, or RR for all other frames that are out-of-profile
- for network egress or access egress, where 4-priority scheduling is enabled:
  - **high-priority**: either `cir = port_speed`, which applies to all frames that are scheduled via an expedited in-profile scheduler, or RR for all other (network egress queue) frames that reside in expedited queues and are in an in-profile state
  - **low-priority**: either `cir = 0`, `pir = port_speed`, which applies to all frames that are scheduled via a best effort out-of-profile scheduler, or RR for all other frames that reside in best-effort queues and are in an out-of-profile state
- for the 8-port Gigabit Ethernet Adapter card, the 10-port 1GigE/1-port 10GigE X-Adapter card, and for the v-port on the 2-port 10GigE (Ethernet) Adapter card and 2-port 10GigE (Ethernet) module, for network egress, where 16-priority scheduling is enabled:
  - **high-priority**: has higher priority than any user frames
  - **low-priority**: has lower priority than any user frames
- for the physical ring ports on the 2-port 10GigE (Ethernet) Adapter card or 2-port 10GigE (Ethernet) module, which can only operate as network egress, the priority of the LBR frame is derived from the `dot1p` setting of the received LBM frame. Based on the assigned ring-type network queue policy, `dot1p`-to-queue mapping is handled using the same mapping rule that applies to all other user frames.

CFM loopback support on a physical ring port on the 2-port 10GigE (Ethernet) Adapter card or 2-port 10GigE (Ethernet) module differs from other Ethernet ports. For these ports, **cfm-loopback** is configured using **dot1p** and an optional list of up to 16 VLANs. The null VLAN is always applied. The CFM Loopback Message will be processed if it does not contain a VLAN header, or if it contains a VLAN header with a VLAN ID that matches one in the configured **match-vlan** list.

The **no** form of the command disables the handling of CFM loopback frames.

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | no cfm-loopback                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Parameters</b> | <p><b>low</b> — sets the queue parameters and scheduler mappings, as described above</p> <p><b>high</b> — sets the queue parameters and scheduler mappings, as described above</p> <p><b>dot1p</b> — sets the queue parameters and scheduler mappings on a physical ring port, as described above</p> <p><b>match-vlan</b> — sets the matching VLAN IDs that will allow a CFM loopback on a physical ring port when <b>priority</b> is set to <b>dot1p</b>, as described above</p> |
| <b>Values</b>     | <p><i>vlan-range</i>: 1 to 4094 (for example, 1-10,33,2123)</p> <p><b>none</b>: only untagged CFM Loopback messages are accepted</p>                                                                                                                                                                                                                                                                                                                                               |
| <b>Default</b>    | <b>none</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

## crc-monitor

|                    |                                                                                   |
|--------------------|-----------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>crc-monitor</b>                                                                |
| <b>Context</b>     | config>port>ethernet                                                              |
| <b>Description</b> | This command enables the context to configure Ethernet CRC monitoring parameters. |

## sd-threshold

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sd-threshold</b> <i>threshold</i> [ <b>multiplier</b> <i>multiplier</i> ]<br><b>no sd-threshold</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | config>port>ethernet>crc-monitor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Description</b> | <p>This command configures the error rate threshold at which the signal degrade condition is declared on an Ethernet interface. The error rate threshold value is the ratio of errored frames over total frames received, which is calculated as an average over the time set by the sliding window. The value is calculated as <math>M \times 10E-N</math>, where M is the optional multiplier used to increase the error ratio, and N is the rate of errored frames allowed (threshold). For example, <math>3 \times 10E-3</math> sets the error rate threshold at 3 errored frames per 1000 total frames received. If <b>no window-size</b> is configured, a default of 10-s is used. The CRC errors on the interface are sampled once per second.</p> <p>The multiplier keyword is optional. If the multiplier keyword is omitted, the default value of 1 is used.</p> <p>The <b>no</b> form of the command disables <b>sd-threshold</b> monitoring.</p> |
| <b>Default</b>     | no sd-threshold                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Parameters</b>  | <p><i>threshold</i> — specifies the threshold value</p> <p><b>Values</b> 1 to 9</p> <p><i>multiplier</i> — specifies the multiplier value</p> <p><b>Values</b> 1 to 9</p> <p><b>Default</b> 1</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

## sf-threshold

|                |                                                                                                        |
|----------------|--------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>  | <b>sf-threshold</b> <i>threshold</i> [ <b>multiplier</b> <i>multiplier</i> ]<br><b>no sf-threshold</b> |
| <b>Context</b> | config>port>ethernet>crc-monitor                                                                       |

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|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b> | <p>This command configures the error rate threshold at which the signal fail condition is declared on an Ethernet interface. The error rate threshold value is the ratio of errored frames over total frames received, which is calculated as an average over the time set by the sliding window. The value is calculated as <math>M \times 10E-N</math>, where M is the optional multiplier used to increase the error ratio, and N is the rate of errored frames allowed (threshold). For example, <math>3 \times 10E-3</math> sets the error rate threshold at 3 errored frames per 1000 total frames received. If no <b>window-size</b> is configured, a default of 10-s is used. The CRC errors on the interface are sampled once per second.</p> <p>The multiplier keyword is optional. If the multiplier keyword is omitted, the default value of 1 is used.</p> <p>The <b>no</b> form of the command disables <b>sf-threshold</b> monitoring.</p> |
| <b>Default</b>     | no sf-threshold                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Parameters</b>  | <p><i>threshold</i> — specifies the threshold value</p> <p><b>Values</b> 1 to 9</p> <p><i>multiplier</i> — specifies the multiplier value</p> <p><b>Values</b> 1 to 9</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

## window-size

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <p><b>window-size</b> <i>seconds</i></p> <p><b>no window-size</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>port>ethernet>crc-monitor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b> | <p>This command configures the sliding window size over which the Ethernet frames are sampled to detect signal fail or signal degrade conditions. The command is used jointly with the <b>sd-threshold</b> and the <b>sf-threshold</b> commands.</p> <p>A sliding window (<b>window-size</b>) is used to calculate a statistical average of CRC error statistics collected every second. Each second, the oldest statistics are dropped from the calculation. For example, if the default 10-s sliding window is configured, at the 11th second the oldest second of statistical data is dropped and the 11th second is included. This sliding average is compared against the configured SD and SF thresholds to determine if the error rate over the window exceeds one or both of the thresholds, which will generate an alarm and log event.</p> <p>The <b>no</b> form of the command disables <b>window-size</b> monitoring.</p> |
| <b>Default</b>     | 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Parameters</b>  | <p><i>seconds</i> — specifies the size of the sliding window over which the errors are measured</p> <p><b>Values</b> 5 to 60</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

## dot1q-etype

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>dot1q-etype</b> <i>0x0600 to 0xffff</i><br><b>no dot1q-etype</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | config>port>ethernet<br>config>port>dsl<br>config>port>gpon                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | <p>This command specifies the Ethertype expected when the port's encapsulation type is dot1q.</p> <p>IEEE 802.1q (also known as VLAN tagging) defines a process to channelize a single Ethernet port or v-port into VLANs. Each VLAN can represent a customer or an application. Up to 4096 VLANs can be configured per port. For more information on VLANs and VLAN tagging, refer to "VLL Services" in the 7705 SAR Services Guide.</p> <p>The Ethertype specifies the protocol being carried in an Ethernet frame. In 802.1q, the Ethertype is set to the Tag Protocol Identifier (TPID) value of 0x8100, which identifies the frame as an IEEE 802.1Q-tagged frame. As well, 2 bytes of Tag Control Information (TCI), followed by 2 bytes containing the frame's original Ethertype are added to the frame. Together, the TPID and TCI make up the VLAN tag.</p> <p>For Ethernet ports, when the port <b>encap-type</b> is <b>qinq</b>, the <b>dot1q-etype</b> value sets the Ethertype for the inner VLAN tag. The <b>qinq</b> encapsulation type is not supported by a v-port, or by DSL or GPON modules on the 7705 SAR-M. However, <b>qinq</b> encapsulation is supported by the DSL block on the 7705 SAR-Wx.</p> <p>Network ports do not allow dot1q-etype settings.</p> <p>The <b>no</b> form of this command resets the dot1q-etype value to the default.</p> |
| <b>Default</b>     | 0x8100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Parameters</b>  | <i>0x0600 to 0xffff</i> — specifies the Ethertype to expect                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

## down-when-looped

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>down-when-looped</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | config>port>ethernet<br>config>port>dsl<br>config>port>gpon                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | <p>This command enables the down-when-looped feature on Ethernet ports or v-ports. When the down-when-looped feature is activated, a keepalive loop PDU is transmitted periodically toward the network. The port listens for returning keepalive loop PDUs. A loop is detected if any of the received PDUs have an Ethertype value of 9000 and the source and destination MAC addresses are identical to the MAC address of the port. When a loop is detected, the port is immediately brought down.</p> |

---

Ethernet port-layer line loopbacks and Ethernet port-layer internal loopbacks can be enabled on the same port with the down-when-looped feature. EFM OAM cannot be enabled on the same port with the down-when-looped feature.

## keep-alive

|                    |                                                                                                                                                            |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>keep-alive</b> <i>timer</i><br><b>no keep-alive</b>                                                                                                     |
| <b>Context</b>     | config>port>ethernet>down-when-looped<br>config>port>dsl>down-when-looped<br>config>port>gpon>down-when-looped                                             |
| <b>Description</b> | This command configures the time interval between the keepalive PDUs transmitted toward the network during loop detection by the down-when-looped feature. |
| <b>Default</b>     | 10 s                                                                                                                                                       |
| <b>Parameters</b>  | <i>timer</i> — the interval between keepalive PDUs<br><b>Values</b> 1 to 120 s                                                                             |

## retry-timeout

|                    |                                                                                                                                                |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>retry-timeout</b> <i>timer</i><br><b>no retry-timeout</b>                                                                                   |
| <b>Context</b>     | config>port>ethernet>down-when-looped<br>config>port>dsl>down-when-looped<br>config>port>gpon>down-when-looped                                 |
| <b>Description</b> | This command configures the minimum wait time before re-enabling the Ethernet port or v-port after it is brought down due to a loop detection. |
| <b>Default</b>     | 120                                                                                                                                            |
| <b>Parameters</b>  | <i>timer</i> — the minimum wait time before re-enabling the Ethernet port or v-port<br><b>Values</b> 0 s or 10 to 160 s                        |

---

## use-broadcast-address

|                    |                                                                                                                                                                                                                                                                                                                      |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] use-broadcast-address</b>                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | config>port>ethernet>down-when-looped<br>config>port>dsl>down-when-looped<br>config>port>gpon>down-when-looped                                                                                                                                                                                                       |
| <b>Description</b> | This command configures the down-when-looped feature to declare a loop when the destination MAC address matches the broadcast MAC address instead of the MAC address of the Ethernet port or v-port. You must enable <b>use-broadcast-address</b> if <b>down-when-looped</b> is enabled on DSL or GPON module ports. |

## duplex

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>duplex {full   half}</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | config>port>ethernet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b> | <p>This command configures the duplex mode of an Ethernet or Fast Ethernet port when autonegotiation is disabled.</p> <p>The 10-port 1GigE/1-port 10GigE X-Adapter card must be in <b>x10-1gb-sfp</b> mode to support this command.</p> <p>SFP slots hosting Ethernet or Fast Ethernet SFPs can be configured to full-duplex or half-duplex mode when autonegotiation is disabled. Duplex autonegotiation is automatically turned off when the user sets the mode with this command. SFP slots hosting optical GigE SFPs only support full-duplex mode; duplex autonegotiation is not supported.</p> <p>On 10 Gb/s ports, the mode is always full duplex and cannot be changed. This includes the ring Ethernet XFP ports and the v-port on the 2-port 10GigE (Ethernet) Adapter card and 2-port 10GigE (Ethernet) module.</p> |
| <b>Default</b>     | full                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

## efm-oam

|                    |                                             |
|--------------------|---------------------------------------------|
| <b>Syntax</b>      | <b>efm-oam</b>                              |
| <b>Context</b>     | config>port>ethernet<br>config>port>dsl     |
| <b>Description</b> | This command configures EFM-OAM attributes. |



---

## accept-remote-loopback

|                    |                                                                                                                                                                  |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] accept-remote-loopback</b>                                                                                                                               |
| <b>Context</b>     | config>port>ethernet>efm-oam<br>config>port>dsl>efm-oam                                                                                                          |
| <b>Description</b> | This command enables reactions to loopback control OAMPDUs from peers.<br><br>The <b>no</b> form of this command disables reactions to loopback control OAMPDUs. |

## hold-time

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>hold-time</b> <i>time-value</i><br><b>no hold-time</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | config>port>ethernet>efm-oam<br>config>port>dsl>efm-oam                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | <p>This command sets the amount of time that EFM-OAM will wait before going from a non-operational state to an operational state.</p> <p>If EFM-OAM goes from an operational state to a non-operational state (other than link-fault), it enters the hold-time period. During this time, EFM-OAM continues to negotiate with the peer if possible, but will not transition to the “up” state until the hold time has expired.</p> <p>If EFM-OAM goes down due to a lower-level fault (for example, the port goes down and EFM-OAM enters the link-fault state), the hold timer is not triggered. When the lower-level fault is cleared, EFM-OAM immediately starts running on the port and transitions to the operational state as soon as possible.</p> <p>If EFM-OAM goes down because the user administratively disables the protocol, EFM-OAM immediately transitions to the disabled state. When the user re-enables EFM-OAM, the protocol enters the hold time period and EFM-OAM is not operational until the hold time expires.</p> <p>A hold-time value of 0 indicates that EFM-OAM returns to the operational state without delay.</p> <p>The hold time affects only the transition from a non-operational state to an operational state; it does not apply to a transition from an operational state to a non-operational state.</p> |
| <b>Parameters</b>  | <i>time-value</i> — the number of seconds that EFM-OAM will wait before returning to an operational state from a non-operational state                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Values</b>      | 0 to 50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Default</b>     | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## mode

|                    |                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mode</b> { <b>active</b>   <b>passive</b> }                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>port>ethernet>efm-oam<br>config>port>dsl>efm-oam                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | This command configures the mode of OAM operation for this Ethernet port.<br><br><b>Active</b> mode causes the port to initiate the negotiation process and continually send out efm-oam information PDUs. <b>Passive</b> mode waits for the peer to initiate the negotiation process. A passive mode port cannot initiate monitoring activities (such as loopback) with the peer. |
| <b>Default</b>     | active                                                                                                                                                                                                                                                                                                                                                                             |

## transmit-interval

|                    |                                                                                                                                                                                                                                        |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] transmit-interval</b> <i>interval</i> [ <b>multiplier</b> <i>multiplier</i> ]                                                                                                                                                  |
| <b>Context</b>     | config>port>ethernet>efm-oam<br>config>port>dsl>efm-oam                                                                                                                                                                                |
| <b>Description</b> | This command configures the transmit interval of OAMPDUs.                                                                                                                                                                              |
| <b>Parameters</b>  | <i>interval</i> — specifies the transmit interval<br><br><b>Values</b> 1 to 600 (in 100 ms)<br><br><i>multiplier</i> — specifies the multiplier for the transmit-interval to set the local link down timer<br><br><b>Values</b> 2 to 5 |

## tunneling

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] tunneling</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | config>port>ethernet>efm-oam<br>config>port>dsl>efm-oam                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | This command enables EFM OAMPDU tunneling. OAMPDU tunneling is required when a loopback is initiated from a router end and must be transported over the existing network infrastructure to the other end. Enabling tunneling will allow the PDUs to be mapped to Epipes so that the OAM frames can be tunneled over MPLS to the far end.<br><br>To enable Ethernet EFM OAM 802.3ah on the port, use the <b>efm-oam&gt;no shutdown</b> command.<br><br>The <b>no</b> form of the command disables tunneling. |

## egress-rate

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>egress-rate</b> <i>sub-rate</i><br><b>no egress-rate</b>                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>port>dsl<br>config>port>gpon                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | <p>This command configures the rate of traffic leaving the network.</p> <p>On the 7705 SAR-M GPON module, this command configures the rate of traffic leaving the GPON port. The egress rate for the GPON port must be configured to match the traffic management parameters provisioned across the PON. These parameters can be viewed via TL1 on the OLT.</p> <p>The <b>no</b> form of this command returns the value to the default.</p> |
| <b>Default</b>     | no egress-rate                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Parameters</b>  | <i>sub-rate</i> — the egress rate in kb/s                                                                                                                                                                                                                                                                                                                                                                                                   |
|                    | <b>Values</b> 1 to 1000000                                                                                                                                                                                                                                                                                                                                                                                                                  |

## egress-rate

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>egress-rate</b> <i>sub-rate</i> [ <b>include-fcs</b> ] [ <b>allow-eth-bn-rate-changes</b> ] [ <b>hold-time</b> <i>hold-time</i> ]<br><b>no egress-rate</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>port>ethernet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b> | <p>This command configures the rate of traffic leaving the network.</p> <p>With the <b>include-fcs</b> option, the egress rate limit is applied to the traffic rate egressing the port with the 4-byte Ethernet FCS field included. If this option is not configured, the egress rate limit is applied to the traffic rate egressing the port without the 4-byte Ethernet FCS field included, and the actual rate of packets leaving the port is slightly higher than the configured egress rate value.</p> <p>The <b>include-fcs</b> option is not supported on the 8-port Ethernet Adapter card (version 2), 7705 SAR-A Fast Ethernet ports (ports 9 to 12), or 4-port SAR-H Fast Ethernet module. On the 6-port SAR-M Ethernet module, the <b>include-fcs</b> option is always on and cannot be disabled to compensate for the 4-byte FCS.</p> <p>The <b>allow-eth-bn-rate-changes</b> option enables the Y.1731 ETH-BN client MEP option on the port. In applications such as a point-to-point microwave link, where degradation on the line can result in reduced link bandwidth, the egress rate can be dynamically changed based on the available bandwidth on the link as indicated by the ETH-BN server. When enabled, the received rate overrides the configured sub-rate for the port. For information on ETH-BN, including which Ethernet ports support this functionality, refer to the 7705 SAR OAM and Diagnostics Guide, "ITU-T Y.1731 Ethernet Bandwidth Notification (ETH-BN)".</p> |

The bandwidth indicated by the ETH-BN server includes the FCS; therefore, the **include-fcs** option must be selected if the **allow-eth-bn-rate-changes** option is selected or the dynamically changed bandwidth will not match the intended rate.

The *hold-time* is used to limit the number of bandwidth changes as requested by the ETH-BN server. After a rate change occurs based on a Bandwidth Notification Message (BNM), any BNM received before the hold timer expires will be ignored.

The **no** form of this command returns the value to the default.

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | no egress-rate                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Parameters</b> | <p><i>sub-rate</i> — the egress rate in kb/s</p> <p><b>Values</b> 1 to 10000000</p> <p><b>include-fcs</b> — the egress rate limit is applied to the traffic rate egressing the port with the 4-byte Ethernet FCS field included. This option must be selected if the <b>allow-eth-bn-rate-changes</b> option is selected; otherwise, the dynamically changed bandwidth will not match the intended rate.</p> <p><b>allow-eth-bn-rate-changes</b> — enables the Y.1731 ETH-BN client MEP option on the port. The egress rate will be dynamically changed to the bandwidth indicated in messages received from an ETH-BN server MEP. When enabled, the received rate overrides the configured sub-rate for the port.</p> <p><i>hold-time</i> — configures the hold time for egress rate bandwidth changes based on a received BNM, in seconds</p> <p><b>Values</b> 1 to 600</p> <p><b>Default</b> 5</p> |

## encap-type

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>encap-type {dot1q   null   qinq}</b><br><b>no encap-type</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>port>ethernet<br>config>port>dsl<br>config>port>gpon                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | <p>This command configures the encapsulation method used to distinguish customer traffic on an Ethernet or DSL access port, network v-port, GPON port, or different VLANs on a network port.</p> <p>Before an MPR-e radio can be configured on an MWA port (see <a href="#">radio</a>), the port must have an encapsulation type of <b>dot1q</b>.</p> <p>The <b>qinq</b> encapsulation type is not supported by a v-port, or by DSL or GPON modules on the 7705 SAR-M. However, <b>qinq</b> encapsulation is supported by the DSL block on the 7705 SAR-Wx.</p> |

The **no** form of this command restores the default.

See also [dot1q-etype](#) and [qinq-etype](#) for information on tagging and encapsulation.

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | null                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Parameters</b> | <p><b>dot1q</b> — ingress frames carry 802.1Q tags, where each tag signifies a different service</p> <p><b>null</b> — ingress frames will not use any tags to delineate a service. As a result, only one service can be configured on a port with a null encapsulation type.</p> <p><b>qinq</b> — ingress frames carry two stacked tags, where the outer tag is the service provider tag and the inner tag is the customer service tag as defined in 802.1ad</p> |

## group-encryption

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] group-encryption</b>                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | config>port>ethernet                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b> | <p>This command enables network group encryption (NGE) on the Ethernet port. When NGE is enabled on the port, all received Layer 2 IS-IS and LLDP packets are considered to be NGE packets and must be encrypted using a valid set of keys from any preconfigured key group on the system.</p> <p>The <b>no</b> form of the command disables NGE on the Ethernet port. NGE cannot be disabled unless all key groups and IP exception filters are removed.</p> |
| <b>Default</b>     | no group-encryption                                                                                                                                                                                                                                                                                                                                                                                                                                           |

## encryption-keygroup

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>encryption-keygroup</b> <i>keygroup-id</i> <b>direction</b> {inbound   outbound}<br><b>no encryption-keygroup</b> <b>direction</b> {inbound   outbound}                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Context</b>     | config>port>ethernet>group-encryption                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Description</b> | <p>This command is used to bind a key group to an Ethernet port for inbound or outbound packet processing. When configured in the outbound direction, packets egressing the router use the <b>active-outbound-sa</b> associated with the configured key group. When configured in the inbound direction, received packets must be encrypted using one of the valid security associations configured for the key group.</p> <p>The <b>no</b> form of the command removes the key group from the Ethernet port in the specified direction.</p> |
| <b>Default</b>     | no encryption-keygroup direction inbound<br>no encryption-keygroup direction outbound                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

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|                   |                                                                      |
|-------------------|----------------------------------------------------------------------|
| <b>Parameters</b> | <i>keygroup-id</i> — the ID number of the key group being configured |
| <b>Values</b>     | 1 to 127   <i>keygroup-name</i> (64 characters maximum)              |
| <b>inbound</b>    | — binds the key group in the inbound direction                       |
| <b>outbound</b>   | — binds the key group in the outbound direction                      |

## hold-time

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>hold-time</b> {[ <b>up</b> <i>hold-time-up</i> ] [ <b>down</b> <i>hold-time-down</i> ]}<br><b>no hold-time</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | config>port>ethernet<br>config>port>dsl                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b> | <p>This command configures port link dampening timers, which reduce the number of link transitions reported to upper layer protocols.</p> <p>The <b>hold-time</b> value is used to dampen interface transitions.</p> <p>When an interface transitions from an up state to a down state, interface down transitions are not advertised to upper layers until the <b>hold-time-down</b> interval has expired. Likewise, when an interface transitions from a down state to an up state, interface up transitions are not advertised until the <b>hold-time-up</b> interval has expired.</p> <p>If the <b>hold-time-down</b> or <b>hold-time-up</b> value is 0, interface down and interface up transitions are immediately reported to upper layer protocols.</p> <p>The <b>no</b> form of this command reverts to the default values.</p> |
| <b>Default</b>     | down 0 or up 0 — no port link dampening is enabled; link transitions are immediately reported to upper layer protocols                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Parameters</b>  | <p><i>hold-time-up</i> — the interval, in seconds, before an interface transition from a down state to an up state is reported to upper layer protocols</p> <p><b>Values</b> 0 to 900</p> <p><i>hold-time-down</i> — the interval, in seconds, before an interface transition from an up state to a down state is reported to upper layer protocols</p> <p><b>Values</b> 0 to 900</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

## ingress-rate

|                |                                                                                                                                                   |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>  | <b>ingress-rate</b> <i>ingress-rate</i> <b>cbs</b> { <i>size</i> [ <i>bytes</i>   <i>kilobytes</i> ]   <b>default</b> }<br><b>no ingress-rate</b> |
| <b>Context</b> | config>port>ethernet                                                                                                                              |

**Description** This command configures a policing action to rate-limit the ingress traffic. Ingress-rate enforcement uses dedicated hardware for rate limiting, however software configuration is required at the port level (ingress-rate limiter) to ensure that the network processor or adapter card or port never receives more traffic than they are optimized for.

The configured ingress rate ensures that the network processor does not receive traffic greater than this configured value on a per-port basis. Once the ingress-rate value is reached, all subsequent frames are dropped. The ingress-rate limiter drops excess traffic without classifying whether the traffic has a higher or lower priority.

Similar to the egress-rate configuration, the ingress-rate configuration survives port mode changes. If a port mode is changed (for example, from access to network mode), the ingress rate and configured CBS still remain when the port comes back up.

The **no** form of this command returns the value to the default.

**Default** no ingress-rate

**Parameters** *ingress-rate* — the ingress rate in Mb/s

**Values** 1 to 10000

**cbs** — specifies the committed burst size that the hard policer can accept while complying with the configured ingress rate. Set the **cbs** value to at least two times the ingress packet size so that the datapath can make a proper policing and forwarding decision.



**Note:** CBS is integrated with the **ingress-rate** command and you must always specify the CBS size every time you configure the ingress rate. If you use the default CBS size, then explicitly indicate that it is the CBS default.

*size* — specifies the committed burst size in bytes or kilobytes. If configured in bytes, the committed burst size must be a multiple of 256 bytes. The default value is 130816 bytes. If configured in kilobytes, the maximum value is 127.

**Values** [1 to 130816 or 1 to 127 | default]

## src-pause

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>src-pause</b><br><b>no src-pause</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Context</b>     | config>port>ethernet>ingress-rate                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b> | <p>This command sends a notification to slow down the transmission rate when it exceeds the bandwidth limit. If incoming traffic exceeds the configured ingress rate, an src-pause frame is sent to the far end to hold transmission (src-pause delay timer). When the src-pause delay timer expires, the far end resumes transmission. The src-pause delay timer varies based on the difference between the incoming traffic rate and the configured ingress rate on the port. If the difference is large, then the far end must wait for a longer period before resuming transmission. The src-pause frame helps to prioritize far-end traffic so that the ingress-rate limiter does not drop high-priority traffic.</p> <p>The ingress-rate limiter can be configured with or without src-pause; however, src-pause is disabled whenever the ingress-rate limiter is disabled.</p> <p>The <b>no</b> form of this command disables the src-pause feature.</p> <p>This command is blocked for the 6-port SAR-M Ethernet module.</p> |
| <b>Default</b>     | no src-pause                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

## lACP-tunnel

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>lACP-tunnel</b><br><b>no lACP-tunnel</b>                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | config>port>ethernet<br>config>port>dsl<br>config>port>gpon                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Description</b> | <p>This command enables LACP packet tunneling for the Ethernet port, DSL port, or GPON port. When tunneling is enabled, the port does not process any LACP packets, but tunnels them instead. A port with LACP packet tunneling enabled cannot be added as a member of a Link Aggregation Group (LAG).</p> <p>The <b>no</b> form of this command disables LACP packet tunneling for the Ethernet port, DSL port, or GPON port.</p> |
| <b>Default</b>     | no lACP-tunnel                                                                                                                                                                                                                                                                                                                                                                                                                     |



## loopback

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>loopback {line   internal} {timer {0   30 .. 86400}   persistent} [swap-src-dst-mac]<br/>no loopback</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>port>ethernet<br>config>port>dsl<br>config>port>gpon                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b> | <p>This command configures timed line loopbacks on Ethernet and GPON network and access ports, timed line loopbacks on ring Ethernet network ports, untimed line loopbacks on Ethernet and GPON access ports, and timed and untimed internal loopbacks on Ethernet ports, DSL ports, and GPON ports.</p> <p>For Ethernet and GPON ports, a line loopback loops frames received on the corresponding port back towards the transmit (egress) direction inside the network processor. Line loopbacks are supported on ports configured in network or access mode.</p> <p>You can swap the source and destination MAC addresses of the received frames using the <b>swap-src-dst-mac</b> keyword. The <b>swap-src-dst-mac</b> keyword is not supported on ring Ethernet ports, GPON ports or DSL ports.</p> <p>An internal loopback loops the frames that are coming in an egress direction from the fabric towards the framer, back to the fabric. This type of loopback is usually referred to as an equipment loopback. Internal loopbacks are supported on ports configured in access mode.</p> <p>Loopback timers can be configured for 30 s to 86400 s. All non-zero timed loopbacks are turned off under the following conditions: an adapter card reset, DSL module reset, GPON module reset, an activity switch, or timer expiry. Line or internal loopbacks can also be configured as a latched loopback by setting the timer to 0 s, or as a persistent loopback with the <b>persistent</b> keyword. The <b>persistent</b> keyword is not supported on GPON ports or DSL ports.</p> <p>Latched and persistent loopbacks are enabled indefinitely until turned off by the user. Latched loopbacks survive adapter card resets and activity switches, but are lost if there is a system restart. Persistent loopbacks survive adapter card resets and activity switches and can survive a system restart if the <b>admin-save</b> or <b>admin-save-detail</b> command was executed prior to the restart. Latched (untimed) persistent loopbacks can be enabled only on Ethernet access ports.</p> <p>If a loopback exists on a port, it must be disabled or the timer must expire before another loopback can be configured on the same port. An Ethernet or DSL loopback cannot be configured on a port that has EFM-OAM enabled on it; EFM-OAM cannot be enabled on a port that has an Ethernet loopback enabled on it. EFM-OAM is not supported on GPON ports.</p> <p>Persistent loopbacks are the only Ethernet loopbacks saved to the database by the <b>admin-save</b> and <b>admin-save-detail</b> commands.</p> <p>The <b>no</b> form of this command disables the specified type of loopback.</p> |

---

|                   |                                                                                                                                                                  |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Parameters</b> | <b>line</b> — places the associated Ethernet port, ring Ethernet port, or GPON port into line loopback mode; not supported on DSL ports                          |
|                   | <b>internal</b> — places the associated Ethernet, DSL, or GPON access port into internal loopback mode; not supported on ring Ethernet ports                     |
|                   | <b>persistent</b> — places the associated Ethernet access port or ring Ethernet port into persistent loopback mode; not supported on DSL ports or GPON ports     |
|                   | <b>swap-src-dst-mac</b> — swaps source and destination MAC addresses for Ethernet line loopbacks; not supported on ring Ethernet ports, DSL ports, or GPON ports |
|                   | <b>timer</b> — the timer set for Ethernet, DSL, or GPON loopbacks, in seconds                                                                                    |
| <b>Values</b>     | 0   30 to 86400                                                                                                                                                  |

## mac

|                    |                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mac</b> <i>ieee-address</i><br><b>no mac</b>                                                                                                                                                                                                                                                                                                           |
| <b>Context</b>     | config>port>ethernet<br>config>port>dsl<br>config>port>gpon                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | This command assigns a specific MAC address to an Ethernet port, ring Ethernet port, v-port, DSL port, or GPON port. When the command is issued while the port is operational, IP will issue an ARP, if appropriate, and BPDUs are sent with the new MAC address.<br><br>The <b>no</b> form of this command returns the MAC address to the default value. |
| <b>Default</b>     | a default MAC address is assigned by the system                                                                                                                                                                                                                                                                                                           |
| <b>Parameters</b>  | <i>ieee-address</i> — specifies the 48-bit MAC address in the form aa:bb:cc:dd:ee:ff or aa-bb-cc-dd-ee-ff where aa, bb, cc, dd, ee, and ff are hexadecimal numbers. Allowed values are any non-broadcast, non-multicast MAC, and non-IEEE reserved MAC addresses.                                                                                         |

## mode

|                    |                                                                                                                                                                                                                                                                         |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mode</b> { <b>access</b>   <b>network</b>   <b>hybrid</b> }<br><b>no mode</b>                                                                                                                                                                                        |
| <b>Context</b>     | config>port>ethernet<br>config>port>dsl<br>config>port>gpon                                                                                                                                                                                                             |
| <b>Description</b> | This command configures an Ethernet port, DSL port, or GPON port for access, network, or hybrid mode operation, or configures a ring Ethernet port or v-port for network mode. On ring Ethernet ports and the v-port, the mode is always network and cannot be changed. |

An **access** port is used for customer-facing traffic on which services are configured. A Service Access Point (SAP) can only be configured on an access port or channel. Once an Ethernet, DSL, or GPON port has been configured for access mode, multiple services can be configured on it.

A **network** port participates in the service provider transport or infrastructure network when network mode is selected.

A **hybrid** Ethernet port allows the combination of network and access modes of operation on a per-VLAN basis and must be configured for either dot1q or qinq encapsulation.

A hybrid port must use dot1q encapsulation to be configured as a network IP interface. Binding a network IP interface to a qinq encapsulation is blocked. In hybrid mode, qinq encapsulation is for access mode use only.

If the hybrid port is configured for dot1q encapsulation, the user configures a SAP inside a service or a network IP interface as follows:

- configure a SAP under **config>service** by providing the SAP ID, which must include the *port-id* value of the hybrid port and an unused VLAN tag value. The format is *port-id:qtag1*. A SAP of format *port-id:\** is also supported.
- configure a network IP interface under **config>router>if>port** by providing the *port-name*, which consists of the *port-id* of the hybrid port and an unused VLAN tag value. The format is *port-id:qtag1*. The user must explicitly enter a valid value for *qtag1*. The *port-id:\** value is not supported on a network IP interface. The VLAN tag space on the port (range of 0 to 4094) is shared among VLAN SAPs and VLAN network IP interfaces.

If the hybrid port is configured for qinq encapsulation, the user configures a SAP inside a service as follows:

- configure a SAP under **config>service** by providing the SAP ID, which must include the *port-id* value of the hybrid port and the outer and inner VLAN tag values. The format is *port-id:qtag1.qtag2*. A SAP of format *port-id: qtag1.\** is also supported. The outer VLAN tag value must not have been used to create an IP network interface on this port. In addition, the *qtag1.qtag2* value combination must not have been used by another SAP on this port.

The **no** form of this command restores the default.

**Default** access (except as listed below)

network (for 10-port 1GigE/1-port 10GigE X-Adapter cards, 2-port 10GigE (Ethernet) Adapter cards, 2-port 10GigE (Ethernet) modules, DSL modules, and GPON modules)

**Parameters** **access** — configures the port as service access

**network** — configures the port for transport network use

**hybrid** — configures the port for hybrid use (transport network and service access per VLAN)

## mtu

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mtu</b> <i>mtu-bytes</i><br><b>no mtu</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Context</b>     | config>port>ethernet<br>config>port>dsl<br>config>port>gpon                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | <p>This command configures the maximum payload MTU size for an Ethernet port, v-port on Ethernet Ring adapter card, DSL, or GPON port (for ring Ethernet ports, the MTU value is fixed at 9728 bytes).</p> <p>The port-level MTU parameter indirectly defines the largest physical packet the port can transmit or the far-end Ethernet port can receive. Packets to be transmitted over a given port that are larger than the MTU of the port will be fragmented or discarded, depending on whether the DF bit is set in the packet header.</p> <p>If the port mode or encapsulation type is changed, the MTU assumes the default values of the new mode or encapsulation type.</p> <p>The <b>no</b> form of this command restores the default values.</p> |
| <b>Default</b>     | The default MTU value depends on the port type, mode, and encapsulation as listed in <a href="#">Table 25</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Parameters</b>  | <p><i>mtu-bytes</i> — sets the maximum allowable size of the MTU, expressed as an integer (see <a href="#">Table 25</a>)</p> <p><b>Values</b></p> <ul style="list-style-type: none"> <li>128 to 9732 bytes (Ethernet ports)</li> <li>512 to 9732 bytes (DSL ports on 7705 SAR-Wx)</li> <li>512 to 2106 bytes (DSL and GPON ports on 7705 SAR-M)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                  |

**Table 25** Port MTU Default and Maximum Values

| Port Type                                 | Mode               | Encap Type        | Default (bytes)                 | Max MTU (bytes)                 |
|-------------------------------------------|--------------------|-------------------|---------------------------------|---------------------------------|
| 10/100 Ethernet <sup>1</sup>              | Access/<br>Network | null              | 1514                            | 9724 <sup>2</sup>               |
|                                           |                    | dot1q             | 1518                            | 9728 <sup>2</sup>               |
|                                           |                    | qinq <sup>3</sup> | 1522 (access only)              | 9732 (access only) <sup>2</sup> |
| GigE SFP <sup>1</sup> and<br>10-GigE SFP+ | Access/<br>Network | null              | 1514 (access)<br>1572 (network) | 9724 (access and<br>network)    |
|                                           |                    | dot1q             | 1518 (access)<br>1572 (network) | 9728 (access and<br>network)    |
|                                           |                    | qinq <sup>3</sup> | 1522 (access only)              | 9732 (access only)              |

**Table 25 Port MTU Default and Maximum Values (Continued)**

| Port Type                       | Mode           | Encap Type        | Default (bytes)                 | Max MTU (bytes)    |
|---------------------------------|----------------|-------------------|---------------------------------|--------------------|
| Ring port                       | Network        | null              | 9728 (fixed)                    | 9728 (fixed)       |
| v-port (on Ring adapter card)   | Network        | null              | 1572                            | 9724               |
|                                 |                | dot1q             | 1572                            | 9728               |
| DSL: SHDSL bonding (7705 SAR-M) | Access/Network | null              | 1514 (access)<br>1572 (network) | 2044               |
|                                 |                | dot1q             | 1518 (access)<br>1572 (network) | 2048               |
| DSL: xDSL bonding (7705 SAR-M)  | Access/Network | null              | 1514 (access)<br>1572 (network) | 1996               |
|                                 |                | dot1q             | 1518 (access)<br>1572 (network) | 2000               |
| DSL: xDSL bonding (7705 SAR-Wx) | Access/Network | null              | 1514 (access)<br>1572 (network) | 1996               |
|                                 |                | dot1q             | 1518 (access)<br>1572 (network) | 2000               |
|                                 |                | qinq <sup>3</sup> | 1522 (access only)              | 2000 (access only) |
| GPON                            | Access/Network | null              | 1514 (access)<br>1572 (network) | 2000               |
|                                 |                | dot1q             | 1518 (access)<br>1572 (network) | 2000               |

**Notes:**

1. The maximum MTU value is supported only on cards that have buffer chaining enabled. Hence, it is not supported on the 8-port Ethernet Adapter card, version 1.
2. On the Packet Microwave Adapter card, MWA ports support 4 bytes less than Ethernet ports. Thus, MWA ports support a maximum MTU of 9720 bytes (null) or 9724 bytes (dot1q). MWA ports do not support qinq.
3. QinQ is supported only on access ports.

## phy-tx-clock

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] phy-tx-clock {auto-pref-master   auto-pref-slave   slave   master}</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | config>port>ethernet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | <p>This command configures the 1000Base-T physical layer transmit clock. The mode affects the establishment of the master-slave relationship between two ports sharing a link segment during auto-negotiation. The master port uses a local clock to determine the timing of transmitter operations. The slave port recovers the clock from the signal it receives and uses the signal to determine the timing of transmitter operations. For ports that do not support 1000Base-T, the value defaults to N/A and cannot be changed.</p> <p>The phy-tx-clock configuration is supported on SFP ports whether or not the SFP is inserted. The <b>phy-tx-clock</b> command applies only to copper-based RJ-45 synchronous Ethernet ports. The command can be used on an SFP port that supports fiber and copper, but the command has no effect if a fiber SFP is installed.</p> <p>The proper value must be set to ensure that the synchronous Ethernet clock relay is correctly configured. See the 7705 SAR Basic System Configuration Guide for more information about synchronous Ethernet.</p> |
| <b>Default</b>     | The default value for the MWA 1000Base-T Ethernet ports on the Packet Microwave Adapter card is master. On other adapter cards, the default value is auto-pref-slave for ports that support 1000Base-T Ethernet connections. The default value is n/a for ports that do not support 1000Base-T Ethernet connections.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Parameters</b>  | <p><b>auto-pref-master</b> — prefers to be master during autonegotiation</p> <p><b>auto-pref-slave</b> — prefers to be slave during autonegotiation</p> <p><b>slave</b> — forces the port to be the slave clocking source</p> <p><b>master</b> — forces the port to be the master clocking source</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

## poe

|                    |                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>poe [plus]</b><br><b>no poe</b>                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | config>port>ethernet                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b> | <p>The <b>poe</b> command enables an RJ-45 or RJ point five port that is Power over Ethernet (PoE) capable to deliver power to a “Powered Device” at levels compatible with the IEEE 802.3af standard.</p> <p>The <b>poe plus</b> command enables an RJ-45 or RJ point five port that is PoE+ capable to deliver power to a “Powered Device” at levels compatible with the IEEE 802.3at standard.</p> |

On the 7705 SAR-H, 7705 SAR-Hc, and 6-port SAR-M Ethernet module, a PoE-capable port can be configured for PoE and PoE+. On the 7705 SAR-W and 7705 SAR-Wx, a PoE-capable port only supports PoE+ and can only be enabled using the **poe plus** command.

On the 7705 SAR-H, before a port can be configured for either PoE or PoE+, the PoE power source option must first be configured as either internal or external using the **config>system>poe-power-source** command; refer to the 7705 SAR Basic System Configuration Guide, “System Command Reference”, for information.

When the 7705 SAR-H is configured for the internal power source option, PoE capability is allowed on ports 5 and 6 only. Port 5 can be configured for PoE+ but in that case, port 6 cannot support PoE. When the system is configured for the external power source option, a mix of PoE and PoE+ is allowed on ports 5, 6, 7, and 8. PoE+ is supported only on ports 5 and 7. [Table 26](#) describes the allowed mix of PoE and PoE+ ports on the 7705 SAR-H.

**Table 26 Supported PoE/PoE+ Combinations on the 7705 SAR-H**

| PoE Power Supply Source | Port 5 | Port 6 | Port 7 | Port 8 | Supported PoE/PoE+ Combinations   |
|-------------------------|--------|--------|--------|--------|-----------------------------------|
| Internal                | PoE    | PoE    | No PoE | No PoE | Two PoE ports                     |
| Internal                | PoE+   | No PoE | No PoE | No PoE | One PoE+ port                     |
| External                | PoE    | PoE    | PoE    | PoE    | Four PoE ports                    |
| External                | PoE    | PoE    | PoE+   | PoE    | Three PoE ports and one PoE+ port |
| External                | PoE+   | No PoE | PoE+   | PoE    | One PoE port and two PoE+ ports   |

On the 6-port SAR-M Ethernet module, ports 5 and 6 on the module can each support PoE. Port 5 can also support PoE+, but if it is configured for PoE+, then port 6 cannot support PoE power.

On the 7705 SAR-Hc, ports 5 and 6 each support PoE and PoE+. If configured for PoE, both ports can be used for PoE simultaneously. Both ports are also capable of supporting PoE+ but not simultaneously; if one port is configured for PoE+, the other port can only be configured for PoE. Ports 5 and 6 can also operate in non-PoE mode.

On the 7705 SAR-W, ports 4 and 5 support PoE+. Both ports can operate in non-PoE+ mode. On the 7705 SAR-Wx, port 5 (the RJ-45 port labeled PoE) supports PoE+. The port can also operate in non-PoE+ mode.

To disable PoE/PoE+ on a port and prevent it from delivering power, use the **no** form of the command. Performing a **shutdown** command on the port does not disable PoE/PoE+ on the port.

**Default** n/a

---

**Parameters**     **plus** — enables PoE+ on the 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-W, 7705 SAR-Wx, and 6-port SAR-M Ethernet module

## ptp-asymmetry

**Syntax**     **ptp-asymmetry** *ptp-asymmetry*  
**no ptp-asymmetry**

**Context**     config>port>ethernet

**Description**     This command configures the PTP asymmetry delay delta on an Ethernet port. The command corrects for known asymmetry for time of day/phase recovery of PTP packets on both local and downstream PTP slave clocks as well as on end-to-end transparent clocks.

**Parameters**     *ptp-asymmetry* — the value in nanoseconds that the forward path delay varies from the mean path delay; the value can be a negative number

## qinq-etype

**Syntax**     **qinq-etype** *0x0600 to 0xffff*  
**no qinq-etype**

**Context**     config>port>ethernet  
config>port>dsl

**Description**     This command specifies the Ethertype expected when the port's encapsulation type is qinq. The **qinq-etype** value sets the Ethertype for the outer VLAN tag when qinq encapsulation is used.

IEEE 802.1ad (also known as VLAN stacking) defines a process to channelize a single Ethernet port or v-port into double-tagged VLANs. Each VLAN can represent a customer or an application. Each tag allows for up to 4096 VLANs to be configured on a port (4096 × 4096 total). For more information on VLANs and VLAN tagging, refer to "VLL Services" in the 7705 SAR Services Guide.

The Ethertype specifies the protocol being carried in an Ethernet frame. In 802.1q, the Ethertype is set to the Tag Protocol Identifier (TPID) value of 0x8100, which identifies the frame as an IEEE 802.1Q-tagged frame. As well, 2 bytes of Tag Control Information (TCI), followed by 2 bytes containing the frame's original Ethertype are added to the frame for each tag (4 bytes total). Together, the TPID and TCI make up a VLAN tag.

The **qinq-etype** command is not supported by a v-port, or by DSL or GPON modules on the 7705 SAR-M. However, **qinq-etype** is supported by the DSL block on the 7705 SAR-Wx.

Network ports do not allow **qinq-etype** settings.

The **no** form of this command resets the qinq-etype value to the default.



---

|                   |                                                             |
|-------------------|-------------------------------------------------------------|
| <b>Default</b>    | 0x8100                                                      |
| <b>Parameters</b> | <i>0x0600 to 0xffff</i> — specifies the Ethertype to expect |

## report-alarm

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] report-alarm [signal-fail] [remote] [local] [no-frame-lock] [high-ber]</b>                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | config>port>ethernet                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | <p>This command specifies when and if to generate alarms and alarm clear notifications for this port.</p> <p>The command applies only to the physical 10GigE ports on the 7705 SAR-X, 6-port Ethernet 10Gbps Adapter card, 2-port 10GigE (Ethernet) Adapter card, and 2-port 10GigE (Ethernet) module, and on the 10-port 1GigE/1-port 10GigE X-Adapter card in 1-port 10GigE mode (select x1-10GigE-sf+ with the <a href="#">mda-mode</a> command).</p> |
| <b>Parameters</b>  | <p><b>signal-fail</b> — reports an Ethernet signal lost alarm</p> <p><b>remote</b> — reports remote faults</p> <p><b>local</b> — reports local faults</p> <p><b>no-frame-lock</b> — reports a “not locked on the ethernet framing sequence” alarm</p> <p><b>high-ber</b> — reports a high bit error rate alarm</p>                                                                                                                                       |

## speed

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>speed {10   100   1000   2500   10000}</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | config>port>ethernet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | This command configures the port speed of an Ethernet port, ring Ethernet port, or v-port when autonegotiation is disabled.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Default</b>     | <p>100 (for Fast Ethernet ports on the 8-port Ethernet Adapter card, 7705 SAR-A (ports 9 to 12), 7705 SAR-Hc (ports 3 and 4), 4-port SAR-H Fast Ethernet module, and 6-port SAR-M Ethernet module (ports 1 and 2))</p> <p>1000 (for Gigabit Ethernet ports on all adapter cards, modules, and fixed platforms)</p> <p>2500 on a v-port (this default cannot be changed)</p> <p>10000 (for the 10-port 1GigE/1-port 10GigE X-Adapter card in 1-port 10GigE mode, 2-port 10GigE (Ethernet) Adapter card, 2-port 10GigE (Ethernet) module, 6-port Ethernet 10Gbps Adapter card (ports 5 and 6), 7705 SAR-X (ports 1/2/7 and 1/3/7))</p> |
| <b>Parameters</b>  | <b>10</b> — sets the link speed to 10 Mb/s                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

- 
- 100** — sets the Ethernet port speed to 100 Mb/s
  - 1000** — sets the Ethernet port speed to 1000 Mb/s (only supported on GigE SFPs)
  - 2500** — sets the v-port speed to 2500 Mb/s (only supported on a v-port)
  - 10000** — sets the ring Ethernet port speed (only supported on GigE XFPs) and the SFP+ ports speed on the 6-port Ethernet 10Gbps Adapter card and a 7705 SAR-X to 10 000 Mb/s

## ssm

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>ssm</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>port>ethernet<br>config>port>dsl                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b> | <p>This command enables the Ethernet Synchronization Message Channel (ESMC) capability on a synchronous Ethernet port on the following:</p> <ul style="list-style-type: none"> <li>• 2-port 10GigE (Ethernet) Adapter card</li> <li>• 2-port 10GigE (Ethernet) module</li> <li>• 6-port Ethernet 10Gbps Adapter card</li> <li>• 8-port Ethernet Adapter card, version 2</li> <li>• 8-port Gigabit Ethernet Adapter card</li> <li>• 10-port 1GigE/1-port 10GigE X-Adapter card</li> <li>• Packet Microwave Adapter card</li> <li>• 4-port SAR-H Fast Ethernet module</li> <li>• DSL module port on the 7705 SAR-M (variants with a module slot)</li> <li>• 7705 SAR-A</li> <li>• 7705 SAR-Ax</li> <li>• 7705 SAR-H</li> <li>• 7705 SAR-Hc</li> <li>• 7705 SAR-M (all variants)</li> <li>• 7705 SAR-W</li> <li>• 7705 SAR-Wx (all variants)</li> <li>• 7705 SAR-X</li> </ul> |

The **ssm** command is enabled and disabled using the **no shutdown** and **shutdown** commands.

On the 2-port 10GigE (Ethernet) Adapter card and 2-port 10GigE (Ethernet) module, SSM frames received on the ring Ethernet ports are extracted for processing through the v-port. Therefore, the v-port must be active (that is, in **no shutdown** mode) in order for SSM to function. The v-port must also be active in order for the 2-port 10GigE (Ethernet) Adapter card or 2-port 10GigE (Ethernet) module to transmit SSM frames. No additional interface or IP configuration is required on the v-port for SSM.

**Default** shutdown

## code-type

**Syntax** **code-type** {sonet | sdh}

**Context** config>port>ethernet>ssm  
config>port>dsl>ssm

**Description** This command specifies whether to use SDH or SONET values for the encoding of synchronous status messages on a:

- synchronous ring Ethernet port on the 2-port 10GigE (Ethernet) Adapter card
- synchronous ring Ethernet port on the 2-port 10GigE (Ethernet) module
- synchronous Ethernet port on the 6-port Ethernet 10Gbps Adapter card
- synchronous Ethernet port on the 8-port Ethernet Adapter card, version 2
- synchronous Ethernet port on the 8-port Gigabit Ethernet Adapter card
- synchronous Ethernet port on the 10-port 1GigE/1-port 10GigE X-Adapter card
- synchronous Ethernet port on the Packet Microwave Adapter card
- synchronous Ethernet port on the 4-port SAR-H Fast Ethernet module
- DSL module port on the 7705 SAR-M (variants with a module slot)
- synchronous Ethernet port on the 7705 SAR-A
- synchronous Ethernet port on the 7705 SAR-Ax
- synchronous Ethernet port on the 7705 SAR-H
- synchronous Ethernet port on the 7705 SAR-Hc
- synchronous Ethernet port on the 7705 SAR-M (all variants)
- synchronous Ethernet port on the 7705 SAR-W
- synchronous Ethernet port on the 7705 SAR-Wx (all variants)
- synchronous Ethernet port on the 7705 SAR-X

**Default** sdh

**Parameters** **sonet** — specifies the values used on a G.781 option 1 compliant network  
**sdh** — specifies the values used on a G.782 option 1 compliant network

## tx-dus

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] tx-dus</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>port>ssm<br>config>port>ethernet>ssm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | <p>This command sets the quality level value transmitted from the Synchronization Status Messaging (SSM) channel of the following ports to QL-DUS/QL-DNU (do not use for synchronization for timing purposes):</p> <ul style="list-style-type: none"> <li>• synchronous Ethernet port on the 2-port 10GigE (Ethernet) Adapter card</li> <li>• synchronous Ethernet port on the 2-port 10GigE (Ethernet) module</li> <li>• synchronous Ethernet port on the 6-port Ethernet 10Gbps Adapter card</li> <li>• synchronous Ethernet port on the 8-port Ethernet Adapter card, version 2</li> <li>• synchronous Ethernet port on the 8-port Gigabit Ethernet Adapter card</li> <li>• synchronous Ethernet port on the 10-port 1GigE/1-port 10GigE X-Adapter card</li> <li>• synchronous Ethernet port on the Packet Microwave Adapter card</li> <li>• synchronous Ethernet port on the 4-port SAR-H Fast Ethernet module</li> <li>• synchronous Ethernet port on the 7705 SAR-A</li> <li>• synchronous Ethernet port on the 7705 SAR-Ax</li> <li>• synchronous Ethernet port on the 7705 SAR-H</li> <li>• synchronous Ethernet port on the 7705 SAR-Hc</li> <li>• synchronous Ethernet port on the 7705 SAR-M (all variants)</li> <li>• synchronous Ethernet port on the 7705 SAR-W</li> <li>• synchronous Ethernet port on the 7705 SAR-Wx (all variants)</li> <li>• synchronous Ethernet port on the 7705 SAR-X</li> </ul> |
| <b>Default</b>     | <p>The value depends on whether the port type is copper or fiber. The default value is:</p> <ul style="list-style-type: none"> <li>• enabled for fiber ports</li> <li>• disabled (no tx-dus) for copper ports</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

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## vlan-filter

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] vlan-filter</b> <i>filter-id</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>port>ethernet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | <p>This command associates a VLAN filter policy with an ingress ring port on the 2-port 10GigE (Ethernet) Adapter card or 2-port 10GigE (Ethernet) module.</p> <p>Filter policies control the forwarding and dropping of packets based on matching criteria. Only one filter policy can be applied to a ring port at a time. The same filter policy can be applied to both ring ports.</p> <p>The <i>filter-id</i> must already be defined before the <b>vlan-filter</b> command is executed. If the filter policy does not exist, the operation will fail and an error message will be displayed.</p> <p>The <b>no</b> form of the command removes any configured <i>filter-id</i> association with the ring port. The filter policy cannot be deleted until it is removed from all ring ports where it is applied.</p> |
| <b>Default</b>     | n/a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Parameters</b>  | <i>filter-id</i> — the VLAN filter policy ID number or filter name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Values</b>      | 1 to 65535 or <i>filter-name</i> (up to 64 characters)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

## xgig

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>xgig {lan   wan}</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Context</b>     | config>port>ethernet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | <p>This command configures the specified 10-Gb/s interface in LAN or WAN mode. When configuring the port for WAN mode, you can change some SONET/SDH parameters to reflect the SONET/SDH requirements for this port. When you configure a port for LAN mode, all SONET/SDH parameters are predetermined and not configurable. The command is supported on the 7705 SAR-X, 6-port Ethernet 10Gbps Adapter card, 10-port 1GigE/1-port 10GigE X-Adapter card, 2-port 10GigE (Ethernet) Adapter card, and 2-port 10GigE (Ethernet) module.</p> <p>On the 6-port Ethernet 10Gbps Adapter card, both 10-Gb/s interfaces (ports 5 and 6) operate in the same <b>xgig</b> mode, either LAN mode or WAN mode. Setting the <b>xgig</b> mode for either port sets the mode for both ports.</p> |
| <b>Default</b>     | lan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Parameters</b>  | <b>lan</b> — specifies that the port operates in LAN mode<br><b>wan</b> — specifies that the port operates in WAN mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

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## xor-mode

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>xor-mode {rj45   rjp5   sfp}</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Context</b>     | config>port>ethernet                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Description</b> | This command configures the operational mode of Ethernet XOR combination ports. Ethernet XOR ports on the 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-H, and 7705 SAR-X can be configured to operate as either RJ-45 ports or SFP ports. Ethernet XOR ports on the 6-port SAR-M Ethernet module can be configured to operate as either RJ point five ports or SFP ports. The mode can be configured on each port independently. Refer to the individual hardware installation guides for more information. |
| <b>Default</b>     | rj45 (for applicable 7705 SAR chassis); rjp5 (for 6-port SAR-M Ethernet module)                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Parameters</b>  | <b>rj45</b> — specifies that the port operate as a 10/100/1000Base-T electrical RJ-45 port (applicable 7705 SAR chassis only)<br><b>rjp5</b> — specifies that the port operate as a 10/100/1000Base-T electrical RJ point five port (6-port SAR-M Ethernet module only)<br><b>sfp</b> — specifies that the port operate as an SFP port                                                                                                                                                           |

### 3.13.2.10 DSL Commands

#### dsl

|                    |                                                                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>dsl</b>                                                                                                                                                     |
| <b>Context</b>     | config>port                                                                                                                                                    |
| <b>Description</b> | This command enables the context to configure DSL port attributes on an 8-port xDSL module, a 6-port DSL Combination module, or an xDSL port on a 7705 SAR-Wx. |

#### adsl2plus

|                    |                                                                                                                                                                                                                                                                                                                                         |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>adsl2plus {g992-5-a   g992-5-b}</b><br><b>no adsl2plus</b>                                                                                                                                                                                                                                                                           |
| <b>Context</b>     | config>port>dsl                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | This command configures a DSL port to support POTS or ISDN non-overlapped spectrum over ADSL2+, in accordance with ITU G.992.5 Annex A and B. This command is supported on the two xDSL ports on the 6-port DSL Combination module, on any port on the 8-port xDSL module configured for xDSL, and on the xDSL port on the 7705 SAR-Wx. |
| <b>Default</b>     | g992-5-a                                                                                                                                                                                                                                                                                                                                |
| <b>Parameters</b>  | <b>g992-5-a</b> — configures the DSL port to support POTS non-overlapped spectrum over ADSL2+ in accordance with ITU G.992.5 Annex A<br><br><b>g992-5-b</b> — configures the DSL port to support ISDN non-overlapped spectrum over ADSL2+ in accordance with ITU G.992.5 Annex B                                                        |

#### atm-pvc

|                    |                                                                                                                                                                                 |               |          |                |   |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------|----------------|---|
| <b>Syntax</b>      | <b>atm-pvc dsl-bonding-vpi dsl-bonding-vci</b><br><b>no atm-pvc</b>                                                                                                             |               |          |                |   |
| <b>Context</b>     | config>port>dsl                                                                                                                                                                 |               |          |                |   |
| <b>Description</b> | This command configures an ATM PVC for traffic on DSL lines in ADSL2 or ADSL2+ bonded ATM mode.                                                                                 |               |          |                |   |
| <b>Parameters</b>  | <i>dsl-bonding-vpi</i> — specifies the VPI of the ATM PVC<br><br><table> <tr> <td><b>Values</b></td><td>0 to 255</td></tr> <tr> <td><b>Default</b></td><td>8</td></tr> </table> | <b>Values</b> | 0 to 255 | <b>Default</b> | 8 |
| <b>Values</b>      | 0 to 255                                                                                                                                                                        |               |          |                |   |
| <b>Default</b>     | 8                                                                                                                                                                               |               |          |                |   |

---

*dsl-bonding-vci* — specifies the VCI of the ATM PVC

**Values** 32 to 65535

**Default** 35

## line

**Syntax** *line number*

**Context** config>port>dsl

**Description** This command configures a DSL line.

**Parameters** *number* — the DSL line number

**Values** 1, 2, 4, 8

- 1 Available for any DSL line
- 2 Reserved for xDSL on the 6-port DSL Combination module
- 4 Reserved for SHDSL on the 6-port DSL Combination module or the xDSL port on the 7705 SAR-Wx
- 8 Reserved for xDSL on the 8-port xDSL module



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### 3.13.2.11 GPON Commands

#### gpon

|                    |                                                                     |
|--------------------|---------------------------------------------------------------------|
| <b>Syntax</b>      | <b>gpon</b>                                                         |
| <b>Context</b>     | config>port                                                         |
| <b>Description</b> | This command enters the context to perform GPON port configuration. |
| <b>Default</b>     | n/a                                                                 |

#### slid

|                    |                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>slid {alphanumeric   hex} <i>slid</i></b><br><b>no slid</b>                                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | config>port>gpon                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b> | <p>This command configures a permanent Subscriber Location ID (SLID). SLIDs can be configured in decimal, alphanumeric or hexadecimal format, but the SLID will always be displayed in hexadecimal format.</p> <p>The <b>no</b> form of the command reverts to the default.</p>                                                                                   |
| <b>Default</b>     | 44:45:46:41:55:4C:54:00:00:00 / "DEFAULT"                                                                                                                                                                                                                                                                                                                         |
| <b>Parameters</b>  | <p><b>alphanumeric</b> — configures the SLID using up to 10 decimal or alphanumeric characters</p> <p><b>hex</b> — configures the SLID using up to 20 hexadecimal numbers, separated by colons or dashes in the form aa:bb:cc:dd:ee:ff:gg:hh:ii:jj or aa-bb-cc-dd-ee-ff-gg-hh-ii-jj</p> <p><i>slid</i> — sets the Subscriber Location ID in the chosen format</p> |

### 3.13.2.12 GNSS Commands

#### gnss

|                    |                                                                              |
|--------------------|------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>gnss</b>                                                                  |
| <b>Context</b>     | config>port                                                                  |
| <b>Description</b> | This command enters the context to perform GNSS receiver port configuration. |
| <b>Default</b>     | n/a                                                                          |

#### antenna-cable-delay

|                    |                                                                                                                                                                               |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>antenna-cable-delay 0 .. 32767</b><br><b>no antenna-cable-delay</b>                                                                                                        |
| <b>Context</b>     | config>port>gnss                                                                                                                                                              |
| <b>Description</b> | This command configures the expected signal delay resulting from the length of the antenna cable.<br><br>The <b>no</b> form of this command returns the value to the default. |
| <b>Default</b>     | 0                                                                                                                                                                             |
| <b>Parameters</b>  | 0 .. 32767 — the signal delay, in nanoseconds                                                                                                                                 |

#### elevation-mask-angle

|                    |                                                                                                                                                                                                                                                                               |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>elevation-mask-angle 0 .. 89</b><br><b>no elevation-mask-angle</b>                                                                                                                                                                                                         |
| <b>Context</b>     | config>port>gnss                                                                                                                                                                                                                                                              |
| <b>Description</b> | This command configures the elevation mask angle. It provides a method of filtering satellites to be used by the system.<br><br>Configuring an elevation mask angle below 10° is not recommended.<br><br>The <b>no</b> form of this command returns the value to the default. |
| <b>Default</b>     | 10                                                                                                                                                                                                                                                                            |
| <b>Parameters</b>  | 0 .. 89 — the elevation mask angle, in degrees.                                                                                                                                                                                                                               |

## type

|                    |                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] type [gps] [glonass]</b>                                                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | config>port>gnss                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b> | <p>This command configures which GNSS system or systems will be used by the GNSS receiver.</p> <p>The <b>no</b> form of this command removes the specified GNSS system or systems.</p> <p>By default, <b>gps</b> is configured. Configuring <b>glonass</b> does not remove <b>gps</b>; the GNSS receiver will use both GPS and GLONASS systems.</p> |
| <b>Default</b>     | gps                                                                                                                                                                                                                                                                                                                                                 |
| <b>Parameters</b>  | <p><b>gps</b> — configures the GNSS receiver to use the American GPS GNSS system</p> <p><b>glonass</b> — configures the GNSS receiver to use the Russian GLONASS GNSS system</p>                                                                                                                                                                    |

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### 3.13.2.13 IEEE 802.1x Ethernet Port Commands

#### dot1x

|                    |                                                                                                                             |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>dot1x</b>                                                                                                                |
| <b>Context</b>     | config>port>ethernet                                                                                                        |
| <b>Description</b> | This command enables access to the context to configure port-specific 802.1x authentication attributes on an Ethernet port. |

#### mac-auth

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] mac-auth</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>port>ethernet>dot1x                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b> | <p>This command enables MAC-based authentication. To use MAC-based authentication, 802.1x authentication must first be enabled using the <a href="#">port-control auto</a> command.</p> <p>When MAC-based authentication is enabled, and the <a href="#">mac-auth-wait</a> timer expires, the 7705 SAR begins listening on the port for valid Ethernet frames. The source address of a received frame is used for MAC-based authentication.</p> <p>The <b>no</b> form of this command disables MAC-based authentication.</p> |
| <b>Default</b>     | no mac-auth                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

#### mac-auth-wait

|                    |                                                                                                                                                                                                                                                                     |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mac-auth-wait</b> <i>seconds</i><br><b>no mac-auth-wait</b>                                                                                                                                                                                                      |
| <b>Context</b>     | config>port>ethernet>dot1x                                                                                                                                                                                                                                          |
| <b>Description</b> | <p>This command configures the delay period before MAC authentication is activated and the 7705 SAR searches for a valid client MAC address.</p> <p>The <b>no</b> form of this command disables the delay and allows MAC authentication to be used immediately.</p> |
| <b>Default</b>     | no mac-auth-wait                                                                                                                                                                                                                                                    |
| <b>Parameters</b>  | <i>seconds</i> — specifies the MAC authentication delay period in seconds                                                                                                                                                                                           |
| <b>Values</b>      | 1 to 3600                                                                                                                                                                                                                                                           |

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## max-auth-req

|                    |                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>max-auth-req</b> <i>max-auth-request</i><br><b>no max-auth-req</b>                                                                                                                                                                                                                                                                                                               |
| <b>Context</b>     | config>port>ethernet>dot1x                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b> | <p>This command configures the maximum number of times that the 7705 SAR will send an access request RADIUS message to the RADIUS server. If a reply is not received from the RADIUS server after the specified number of attempts, the 802.1x authentication process is considered to have failed.</p> <p>The <b>no</b> form of this command returns the value to the default.</p> |
| <b>Default</b>     | 2                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Parameters</b>  | <i>max-auth-req</i> — the maximum number of RADIUS retries<br><b>Values</b> 1 to 10                                                                                                                                                                                                                                                                                                 |

## port-control

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>port-control</b> { <b>auto</b>   <b>force-auth</b>   <b>force-unauth</b> }<br><b>no port-control</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>port>ethernet>dot1x                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b> | <p>This command configures the 802.1x authentication mode.</p> <p>The <b>no</b> form of this command returns the value to the default.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Default</b>     | force-auth                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Parameters</b>  | <p><b>auto</b> — enables 802.1x authentication. The port starts in the unauthorized state, allowing only EAPOL frames to be sent and received through the port. Both the 7705 SAR and the host (supplicant) can initiate an authentication process. The port will remain in the unauthorized state until the first supplicant is authenticated successfully. After this, traffic is allowed on the port for all connected hosts.</p> <p><b>force-auth</b> — disables 802.1x authentication and causes the port to transition to the authorized state without requiring any authentication exchange. The port transmits and receives normal traffic without requiring 802.1x-based host authentication.</p> <p><b>force-unauth</b> — causes the port to remain in the unauthorized state, ignoring all attempts by the hosts to authenticate. The authenticator cannot provide authentication services to the host through the interface.</p> |

## quiet-period

|                    |                                                                                                                                                                                                                                                                                                                           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>quiet-period</b> <i>seconds</i><br><b>no quiet-period</b>                                                                                                                                                                                                                                                              |
| <b>Context</b>     | config>port>ethernet>dot1x                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | <p>This command configures the time between two authentication sessions during which no EAPOL frames are sent by the 7705 SAR. The timer is started after sending an EAP-Failure message or after expiry of the supplicant timeout timer.</p> <p>The <b>no</b> form of this command returns the value to the default.</p> |
| <b>Default</b>     | 60                                                                                                                                                                                                                                                                                                                        |
| <b>Parameters</b>  | <i>seconds</i> — specifies the quiet period in seconds<br><b>Values</b> 1 to 3600                                                                                                                                                                                                                                         |

## radius-plcy

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>radius-plcy</b> <i>name</i><br><b>no radius-plcy</b>                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Context</b>     | config>port>ethernet>dot1x                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | <p>This command configures the RADIUS policy to be used for 802.1x authentication. An 802.1x RADIUS policy must be configured (under <b>config&gt;system&gt;security&gt;dot1x</b>) before it can be associated with a port. If the RADIUS policy ID does not exist, an error is returned. Only one 802.1x RADIUS policy can be associated with a port at a time.</p> <p>The <b>no</b> form of this command removes the RADIUS policy association.</p> |
| <b>Default</b>     | no radius-plcy                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Parameters</b>  | <i>name</i> — specifies an existing 802.1x RADIUS policy name                                                                                                                                                                                                                                                                                                                                                                                         |

## re-auth-period

|                    |                                                                                                                                                                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>re-auth-period</b> <i>seconds</i><br><b>no re-auth-period</b>                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>port>ethernet>dot1x                                                                                                                                                                                                                                                                               |
| <b>Description</b> | <p>This command configures the number of seconds the system will wait before performing reauthentication. This value is only relevant if reauthentication is enabled with the <a href="#">re-authentication</a> command.</p> <p>The <b>no</b> form of this command returns the value to the default.</p> |

|                   |                                                                         |
|-------------------|-------------------------------------------------------------------------|
| <b>Default</b>    | 3600                                                                    |
| <b>Parameters</b> | <i>seconds</i> — specifies the reauthentication delay period in seconds |
| <b>Values</b>     | 1 to 9000                                                               |

## re-authentication

|                    |                                                                                                                                                                                                                                                                                                                                                |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] re-authentication</b>                                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | config>port>ethernet>dot1x                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | <p>This command enables or disables periodic 802.1x reauthentication.</p> <p>When reauthentication is enabled, the 7705 SAR will reauthenticate clients on the port after waiting the number of seconds defined by the <a href="#">re-auth-period</a> command.</p> <p>The <b>no</b> form of this command disables 802.1x reauthentication.</p> |
| <b>Default</b>     | no re-authentication                                                                                                                                                                                                                                                                                                                           |

## server-timeout

|                    |                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>server-timeout</b> <i>seconds</i><br><b>no server-timeout</b>                                                                                                                                                                                                                                                                                                                   |
| <b>Context</b>     | config>port>ethernet>dot1x                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | <p>This command configures the time during which the 7705 SAR waits for the RADIUS server to respond to its access request message. When this timer expires, the 7705 SAR will resend the access request message, up to the number of times specified by the <a href="#">max-auth-req</a> command.</p> <p>The <b>no</b> form of this command returns the value to the default.</p> |
| <b>Default</b>     | 30                                                                                                                                                                                                                                                                                                                                                                                 |

---

**Parameters**    *seconds* — specifies the server timeout period in seconds  
**Values**        1 to 300

## supplicant-timeout

**Syntax**        **supplicant-timeout** *seconds*  
**no supplicant-timeout**

**Context**       config>port>ethernet>dot1x

**Description**   This command configures the time the 7705 SAR waits for a client to respond to its EAPOL messages. When the supplicant timeout period expires, the 802.1x authentication session is considered to have failed.

The **no** form of this command returns the value to the default.

**Default**        30

**Parameters**    *seconds* — specifies the supplicant timeout period in seconds  
**Values**        1 to 300

## transmit-period

**Syntax**        **transmit-period** *seconds*  
**no transmit-period**

**Context**       config>port>ethernet>dot1x

**Description**   This command configures the time after which the 7705 SAR sends a new EAPOL request message.

The **no** form of this command returns the value to the default.

**Default**        30

**Parameters**    *seconds* — specifies the server transmit period in seconds  
**Values**        1 to 3600



### 3.13.2.14 LLDP Ethernet Port Commands

Refer to the 7705 SAR Basic System Configuration Guide, “System Management”, for LLDP system commands.

#### lldp

|                    |                                                                                      |
|--------------------|--------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>lldp</b>                                                                          |
| <b>Context</b>     | config>port>ethernet                                                                 |
| <b>Description</b> | This command enables the context to configure LLDP parameters on the specified port. |



**Note:** In order for LLDP to be operational on the Ethernet ports on the 2-port 10GigE (Ethernet) Adapter card/module, the v-port must be active (that is, in **no shutdown** mode).

#### dest-mac

|                    |                                                                                                                                                                                                                                                                    |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>dest-mac</b> { <b>nearest-bridge</b>   <b>nearest-non-tpmr</b>   <b>nearest-customer</b> }                                                                                                                                                                      |
| <b>Context</b>     | config>port>ethernet>lldp                                                                                                                                                                                                                                          |
| <b>Description</b> | This command configures destination MAC address parameters.                                                                                                                                                                                                        |
| <b>Parameters</b>  | <b>nearest-bridge</b> — configures the LLDP to use the nearest bridge<br><b>nearest-non-tpmr</b> — configures the LLDP to use the nearest non-two-port MAC relay (TPMR) bridge<br><b>nearest-customer</b> — configures the LLDP to use the nearest customer bridge |

#### admin-status

|                    |                                                                                                                                                                                                                                                                         |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>admin-status</b> { <b>rx</b>   <b>tx</b>   <b>tx-rx</b>   <b>disabled</b> }                                                                                                                                                                                          |
| <b>Context</b>     | config>port>ethernet>lldp>dest-mac                                                                                                                                                                                                                                      |
| <b>Description</b> | This command specifies the administratively desired status of the local LLDP agent.                                                                                                                                                                                     |
| <b>Default</b>     | disabled                                                                                                                                                                                                                                                                |
| <b>Parameters</b>  | <b>rx</b> — specifies that the LLDP agent will receive, but will not transmit, LLDP frames on this port<br><b>tx</b> — specifies that the LLDP agent will transmit LLDP frames on this port and will not store any information about the remote systems connected to it |

**tx-rx** — specifies that the LLDP agent will transmit and receive LLDP frames on this port

**disabled** — specifies that the LLDP agent will not transmit or receive LLDP frames on this port. If there is remote system information that was received on this port and stored in other tables before the port's admin-status was disabled, the information will naturally age out.

## notification

|                    |                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] notification</b>                                                                                       |
| <b>Context</b>     | config>port>ethernet>lldp>dest-mac                                                                             |
| <b>Description</b> | This command enables LLDP notifications.<br><br>The <b>no</b> form of the command disables LLDP notifications. |
| <b>Default</b>     | no notification                                                                                                |

## tx-mgmt-address

|                    |                                                                                                                                                                                                                                                                                        |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>tx-mgmt-address [system]</b><br><b>no tx-mgmt-address</b>                                                                                                                                                                                                                           |
| <b>Context</b>     | config>port>ethernet>lldp>dest-mac                                                                                                                                                                                                                                                     |
| <b>Description</b> | This command specifies which management address to transmit. The 7705 SAR can only be configured to send or not send the system address.<br><br>If the <b>no</b> form of the command is used, the port will not include the system management address TLV in any LLDPDUs it transmits. |
| <b>Default</b>     | no tx-mgmt-address                                                                                                                                                                                                                                                                     |
| <b>Parameters</b>  | <b>system</b> — specifies to use the system IP address. The system address is only transmitted after it has been configured.                                                                                                                                                           |

## tx-tlvs

|                    |                                                                                 |
|--------------------|---------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>tx-tlvs [port-desc] [sys-name] [sys-desc] [sys-cap]</b><br><b>no tx-tlvs</b> |
| <b>Context</b>     | config>port>ethernet>lldp>dest-mac                                              |
| <b>Description</b> | This command specifies which LLDP optional TLVs to transmit.                    |

---

If the **no** form of the command is used, the port will not include any optional TLVs in any LLDPDUs it transmits.

**Default**    no tx-tlvs

**Parameters**    **port-desc** — indicates that the LLDP agent should transmit port description TLVs  
**sys-name** — indicates that the LLDP agent should transmit system name TLVs  
**sys-desc** — indicates that the LLDP agent should transmit system description TLVs  
**sys-cap** — indicates that the LLDP agent should transmit system capabilities TLVs

---

### 3.13.2.15 Ring MAC Operations Commands

#### disable-aging

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] disable-aging</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | config>card>mda>ring                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Description</b> | <p>This command disables MAC address aging across an Ethernet ring.</p> <p>As is the case for a Layer 2 switch, learned MACs can be aged out if no packets are sourced from the MAC address for a period of time (the aging time). In each ring, there are independent aging timers for local learned MAC and remote learned MAC entries in the FDB. The <b>disable-aging</b> command turns off aging for local and remote learned MAC addresses.</p> <p>The <b>no</b> form of this command enables aging on the ring.</p> |
| <b>Default</b>     | no disable-aging                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

#### disable-learning

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] disable-learning</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Context</b>     | config>card>mda>ring                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b> | <p>This command disables learning of new MAC addresses in the ring FDB.</p> <p>When <b>disable-learning</b> is enabled, new source MAC addresses will not be entered in the ring FDB. This is true for both local and remote MAC addresses.</p> <p>When <b>disable-learning</b> is disabled, new source MAC addresses will be learned and entered into the ring FDB.</p> <p>This parameter is mainly used in conjunction with the <b>discard-unknown-source</b> command.</p> <p>The <b>no</b> form of this command enables learning of MAC addresses.</p> |
| <b>Default</b>     | no disable-learning                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

---

## discard-unknown-source

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] discard-unknown-source</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Context</b>     | config>card>mda>ring                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b> | <p>This command specifies that packets with an unknown source MAC address received on a ring port will be dropped if the source MAC is not already in the FDB (that is, the source MAC was not learned before the <b>discard-unknown-source</b> command was enabled or is not a static entry already created for the packet MAC).</p> <p>When disabled, the packets are flooded to the other ring port or forwarded to the v-port (if the packets are addressed to the v-port).</p> <p>The <b>no</b> form of this command disables discard-unknown-source.</p> |
| <b>Default</b>     | no discard-unknown-source                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

## fdb-table-high-wmark

|                    |                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>fdb-table-high-wmark</b> <i>high-water-mark</i><br><b>no fdb-table-high-wmark</b>                                                                                                                                                                                                                                                                           |
| <b>Context</b>     | config>card>mda>ring                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b> | <p>This command specifies the upper threshold value for learned FDB entries. The high-water-mark is configured as a percentage of the FDB. When the number of FDB entries exceeds the <i>high-water-mark</i>, the system raises a log event.</p> <p>The <b>no</b> form of this command returns the maximum FDB table high-water-mark to the default (95%).</p> |
| <b>Default</b>     | no fdb-table-high-wmark                                                                                                                                                                                                                                                                                                                                        |
| <b>Parameters</b>  | <i>high-water-mark</i> — specifies the upper threshold for FDB entries as a percentage of FDB table size, which when exceeded, causes the system to raise a log event                                                                                                                                                                                          |
| <b>Values</b>      | 0 to 100                                                                                                                                                                                                                                                                                                                                                       |

## fdb-table-size

|                    |                                                                                           |
|--------------------|-------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>fdb-table-size</b> <i>table-size</i><br><b>no fdb-table-size</b>                       |
| <b>Context</b>     | config>card>mda>ring                                                                      |
| <b>Description</b> | This command specifies the maximum number of MAC entries in the dynamic FDB for the ring. |

The **no** form of this command returns the maximum FDB table size to the default (512).

|                   |                                                                                       |
|-------------------|---------------------------------------------------------------------------------------|
| <b>Default</b>    | no fdb-table-size                                                                     |
| <b>Parameters</b> | <i>table-size</i> — the maximum number of learned MAC entries in the FDB for the ring |
| <b>Values</b>     | 4 to 512                                                                              |

## mac-pinning

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] mac-pinning port <i>port-id</i></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Context</b>     | config>card>mda>ring                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b> | This command keeps MAC address information that has been learned from a source frame in the FDB until the expiry of the mac-aging timer, which is specified using the <a href="#">remote-age</a> command). If a MAC address is pinned and a frame with an existing source MAC address is received from the other ring port, the FDB entry is not altered—the address that was learned from the first source frame is preserved until the expiry of the aging timer. If the aging timer is disabled, then the MAC address remains pinned until the timer is enabled again. |
|                    | The <b>no</b> form of this command disables mac-pinning.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Default</b>     | no mac-pinning                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Parameters</b>  | <i>port-id</i> — specifies the physical ring port                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

## remote-age

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>remote-age <i>aging-timer</i></b><br><b>no remote-age</b>                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>card>mda>ring                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | This command specifies the aging time for remotely learned MAC addresses in the FDB.<br><br>As is the case for a Layer 2 switch, learned MAC addresses can be aged out if no packets are sourced from the MAC address for a period of time (the aging time). The <b>remote-age</b> timer specifies the aging time for remotely learned MAC addresses.<br><br>The <b>no</b> form of this command returns the remote aging timer to the default value (900 s). |
| <b>Default</b>     | no remote-age                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Parameters</b>  | <i>aging-timer</i> — the aging time for remote MAC addresses, expressed in seconds                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Values</b>      | 60 to 86400                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

---

## static-mac

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] static-mac mac</b> <i>ieee-address</i> <b>port</b> <i>port-id</i> [ <b>create</b> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Context</b>     | config>card>mda>ring                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | <p>This command creates a local static MAC entry in the FDB for the specified port. The maximum number of static MAC addresses per ring adapter card is 256.</p> <p>Static MAC definitions on one edge device are not propagated to other edge devices; that is, each edge device has an independent FDB.</p> <p>Only one static MAC entry (local or remote) can be defined per MAC address per instance.</p> <p>By default, no static MAC address entries are defined.</p> <p>The <b>no</b> form of this command deletes the static MAC entry with the specified MAC address associated with the port from the FDB.</p> |
| <b>Parameters</b>  | <p><i>ieee-address</i> — specifies the 48-bit MAC address for the static ARP in the form <i>aa:bb:cc:dd:ee:ff</i> or <i>aa-bb-cc-dd-ee-ff</i> where <i>aa</i>, <i>bb</i>, <i>cc</i>, <i>dd</i>, <i>ee</i> and <i>ff</i> are hexadecimal numbers (cannot be all zeros). Allowed values are any non-broadcast, non-multicast MAC, and non-IEEE reserved MAC addresses.</p> <p><i>port-id</i> — specifies the port that is associated with the specified MAC address</p> <p><b>create</b> — this keyword is mandatory when specifying a static MAC address</p>                                                              |

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### 3.13.2.16 Serial Commands

#### serial

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>serial</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | config>port                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | <p>This command enables the context to configure RS-232, V.35, or X.21 parameters for a port on a channelized 12-port Serial Data Interface card, or to configure RS-232 parameters for an RS-232 port on the 7705 SAR-Hc or on the 4-port T1/E1 and RS-232 Combination module. This context cannot be accessed by any other card.</p> <p>A serial port configuration allows some or all of the bandwidth to be dedicated to a port by aggregating a number of DS0s into a single bundle.</p> <p>Serial data transmission rates below the rate of a single DS0, that is, less than 64 kb/s, are achieved using a proprietary protocol called High Capacity Multiplexing (HCM). These speeds, known as subrate speeds, are supported only on RS-232 and X.21 ports.</p> <p>On the 12-port Serial Data Interface card, if the port has been enabled for an RS-530 interface through the use of an adapter cable, X.21 configuration applies to the RS-530 interface. There is no configuration specifically for RS-530 operation.</p> |
| <b>Default</b>     | n/a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

#### rs232

|                    |                                                                                                                                                                                                                                                                                                                           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] rs232</b>                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>port>serial                                                                                                                                                                                                                                                                                                        |
| <b>Description</b> | <p>This command enables the context to configure RS-232 parameters for a channel. Once one of the three ports on a connector has been configured for an RS-232 channel, the other two ports on the connector can only be configured for RS-232.</p> <p>The <b>no</b> form of this command deletes the RS-232 channel.</p> |
| <b>Default</b>     | n/a                                                                                                                                                                                                                                                                                                                       |



---

## v35

|                    |                                                                                                                                                                                                                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] v35</b>                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | config>port>serial                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | This command enables the context to configure V.35 parameters for a channel. Once one of the three ports on a connector has been configured for a V.35 channel, the other two ports on the connector can only be configured for V.35. The <b>no</b> form of this command deletes the V.35 channel. |
| <b>Default</b>     | n/a                                                                                                                                                                                                                                                                                                |

## x21

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] x21</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>port>serial                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b> | <p>This command enables the context to configure X.21 parameters for a channel. When one of the three ports on a connector has been configured for an X.21 channel, the other two ports on the connector can only be configured for X.21.</p> <p>The <b>no</b> form of this command deletes the X.21 channel.</p> <p>If the port has been enabled for an RS-530 interface through the use of an adapter cable, X.21 configuration applies to the RS-530 interface. There is no configuration specifically for RS-530 operation. All X.21 functionality is available on the RS-530 interface, except that only DCE operation is supported for RS-530. However, because X.21 does not support all the control leads available for RS-530, only a subset of the RS-530 control leads are supported.</p> |
| <b>Default</b>     | n/a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

## character-length

|                    |                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>character-length {6   7   8}</b>                                                                                                                                                                                                                                                                                                                            |
| <b>Context</b>     | config>port>serial>rs232<br>config>port>serial>x21                                                                                                                                                                                                                                                                                                             |
| <b>Description</b> | This command configures the number of data bits used to transmit a character. This command is valid only if <a href="#">device-mode</a> is asynchronous. The value for this command cannot be 8 if the value for <a href="#">parity</a> is anything other than no parity (that is, anything other than none) and the value for <a href="#">stop-bits</a> is 2. |
| <b>Default</b>     | 8                                                                                                                                                                                                                                                                                                                                                              |
| <b>Parameters</b>  | <b>6</b> — specifies six bits in a character                                                                                                                                                                                                                                                                                                                   |

- 7 — specifies seven bits in a character
- 8 — specifies eight bits in a character

clock-source

- Syntax

clock-source {slave}
- Context

config>port>serial>rs232  
config>port>serial>v35  
config>port>serial>x21
- Description

This command configures the source of the transmit clock. This command is valid only if [device-mode](#) is synchronous, and only the slave mode is supported.
- Default

slave
- Parameters

— see [Table 27](#). See the [device-gender](#) command for information on setting DTE or DCE on Serial Data Interface ports.

Table 27 Synchronous Clocking Options

| Attached Device Gender           |       | Circuit Gender |       | Transmit Clock Option | Description                                                                                                             |
|----------------------------------|-------|----------------|-------|-----------------------|-------------------------------------------------------------------------------------------------------------------------|
| DTE*                             | DCE** | DTE*           | DCE** |                       |                                                                                                                         |
| ✓                                |       |                | ✓     | Slave                 | DCE slave — the transmit and receive clocks are derived from the BRG locked to the system timing                        |
|                                  | ✓     | ✓              |       | Slave                 | DTE slave — the transmit clock and the receive clock are supplied by the attached DCE device (this is the default mode) |
| * Data Terminal Equipment        |       |                |       |                       |                                                                                                                         |
| ** Data Communications Equipment |       |                |       |                       |                                                                                                                         |

control-lead

- Syntax

control-lead {input | output}
- Context

config>port>serial>rs232  
config>port>serial>v35  
config>port>serial>x21
- Description

This command enables access to the context to configure the input and output leads that carry control signals. Control signals provide the handshaking for call setup, teardown, and synchronization.

---

**Default** n/a

## input

**Syntax** **input**

**Context** config>port>serial>rs232>control-lead  
 config>port>serial>v35>control-lead  
 config>port>serial>x21>control-lead

**Description** This command enables access to the context to configure the input control leads.

**Default** n/a

## alb-cts

**Syntax** **alb-cts {high | low | end-to-end}**

**Context** config>port>serial>rs232>control-lead>input  
 config>port>serial>v35>control-lead>input

**Description** This command configures the Analog Loopback (ALB) or Clear To Send (CTS) input control lead. The input signal that is sent depends on the [device-gender](#) setting. For a DCE device, the input signal is ALB. For a DTE device, the input signal is CTS.

This command is valid only for RS-232 and V.35 interfaces.

**Default** high

**Parameters** **high** — the input control lead is assumed to be on  
**low** — the input control lead is assumed to be off  
**end-to-end** — the input control lead follows that of the remote end. This parameter is not supported for interface speeds  $\geq 64$  kb/s.

## c-i

**Syntax** **c-i {high | low | end-to-end}**

**Context** config>port>serial>x21>control-lead>input

**Description** This command configures the Control (C) or Indication (I) input control lead. The input signal that is sent depends on the [device-gender](#) setting. For a DCE device, the input signal is C. For a DTE device, the input signal is I.

This command is valid only for an X.21 interface.

---

|                   |                                                                                                                                                                                     |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | high                                                                                                                                                                                |
| <b>Parameters</b> | <b>high</b> — the input control lead is forced on<br><b>low</b> — the input control lead is forced off<br><b>end-to-end</b> — the input control lead follows that of the remote end |

## dtr-dsr

|                    |                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>dtr-dsr {high   low}</b>                                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | config>port>serial>rs232>control-lead>input<br>config>port>serial>v35>control-lead>input                                                                                                                                                                                                                                                             |
| <b>Description</b> | <p>This command configures the Data Terminal Ready (DTR) or Data Set Ready (DSR) input control lead. The input signal that is sent depends on the <a href="#">device-gender</a> setting. For a DCE device, the input signal is DTR. For a DTE device, the input signal is DSR.</p> <p>This command is valid only for RS-232 and V.35 interfaces.</p> |
| <b>Default</b>     | high                                                                                                                                                                                                                                                                                                                                                 |
| <b>Parameters</b>  | <b>high</b> — the input control lead is assumed to be on<br><b>low</b> — the input control lead is assumed to be off                                                                                                                                                                                                                                 |

## rdl-ri

|                    |                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>rdl-ri {high   low}</b>                                                                                                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>port>serial>rs232>control-lead>input                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | <p>This command configures the Remote Digital Loopback (RDL) or Ring Indicator (RI) input control lead. The input signal that is sent depends on the <a href="#">device-gender</a> setting. For a DCE device, the input signal is RDL. For a DTE device, the input signal is RI.</p> <p>This command is valid only for an RS-232 interface.</p> |
| <b>Default</b>     | high                                                                                                                                                                                                                                                                                                                                            |
| <b>Parameters</b>  | <b>high</b> — the input control lead is assumed to be on<br><b>low</b> — the input control lead is assumed to be off                                                                                                                                                                                                                            |

---

## rts-dcd

|                    |                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>rts-dcd {high   low   end-to-end}</b>                                                                                                                                                                                                                                                                                                              |
| <b>Context</b>     | Config>port>serial>rs232>control-lead>input<br>Config>port>serial>v35>control-lead>input                                                                                                                                                                                                                                                              |
| <b>Description</b> | <p>This command configures the Request To Send (RTS) or Data Carrier Detect (DCD) input control lead. The input signal that is sent depends on the <a href="#">device-gender</a> setting. For a DCE device, the input signal is RTS. For a DTE device, the input signal is DCD.</p> <p>This command is valid only for RS-232 and V.35 interfaces.</p> |
| <b>Default</b>     | high                                                                                                                                                                                                                                                                                                                                                  |
| <b>Parameters</b>  | <p><b>high</b> — the input control lead is assumed to be on</p> <p><b>low</b> — the input control lead is assumed to be off</p> <p><b>end-to-end</b> — the input control lead follows that of the remote end. This parameter is not supported for interface speeds <math>\geq 64</math> kb/s.</p>                                                     |

## monitor

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>monitor</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | config>port>serial>rs232>control-lead<br>config>port>serial>v35>control-lead<br>config>port>serial>x21>control-lead                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b> | <p>This command enables access to the context to monitor the input control leads. When monitoring is enabled on a control lead, the 7705 SAR polls the status of the control lead every second. Any change in state of the control lead causes an alarm to be raised. This functionality provides an indication to the operator of a problem in the DTE-to-DCE path; for example, it can indicate that the far-end device is disconnected.</p> <p>Monitoring is enabled on a per-lead basis. The monitoring functionality is supported on ports configured for either DTE or DCE.</p> |
| <b>Default</b>     | n/a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

---

## alb-cts

|                    |                                                                                                                                                                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>alb-cts {on   off}</b>                                                                                                                                                                                                                                                          |
| <b>Context</b>     | config>port>serial>rs232>control-lead>monitor<br>config>port>serial>v35>control-lead>monitor                                                                                                                                                                                       |
| <b>Description</b> | <p>This command enables monitoring on the Analog Loopback (ALB) or Clear To Send (CTS) input control lead. For a DCE device, the input control lead is ALB. For a DTE device, the input control lead is CTS.</p> <p>This command is valid only for RS-232 and V.35 interfaces.</p> |
| <b>Default</b>     | off                                                                                                                                                                                                                                                                                |
| <b>Parameters</b>  | <b>on</b> — monitoring is enabled on the lead<br><b>off</b> — monitoring is disabled on the lead                                                                                                                                                                                   |

## c-i

|                    |                                                                                                                                                                                                                                                        |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>c-i {on   off}</b>                                                                                                                                                                                                                                  |
| <b>Context</b>     | config>port>serial>x21>control-lead>monitor                                                                                                                                                                                                            |
| <b>Description</b> | <p>This command enables monitoring on the Control (C) or Indication (I) input control lead. For a DCE device, the input control lead is C. For a DTE device, the input control lead is I.</p> <p>This command is valid only for an X.21 interface.</p> |
| <b>Default</b>     | off                                                                                                                                                                                                                                                    |
| <b>Parameters</b>  | <b>on</b> — monitoring is enabled on the lead<br><b>off</b> — monitoring is disabled on the lead                                                                                                                                                       |

## dtr-dsr

|                    |                                                                                                                                                                                                                                                                                         |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>dtr-dsr {on   off}</b>                                                                                                                                                                                                                                                               |
| <b>Context</b>     | config>port>serial>rs232>control-lead>monitor<br>config>port>serial>v35>control-lead>monitor                                                                                                                                                                                            |
| <b>Description</b> | <p>This command enables monitoring on the Data Terminal Ready (DTR) or Data Set Ready (DSR) input control lead. For a DCE device, the input control lead is DTR. For a DTE device, the input control lead is DSR.</p> <p>This command is valid only for RS-232 and V.35 interfaces.</p> |
| <b>Default</b>     | off                                                                                                                                                                                                                                                                                     |

---

**Parameters**    **on** — monitoring is enabled on the lead  
                  **off** — monitoring is disabled on the lead

## rdl-ri

**Syntax**        **rdl-ri {on | off}**

**Context**        config>port>serial>rs232>control-lead>monitor

**Description**    This command enables monitoring on the Remote Digital Loopback (RDL) or Ring Indicator (RI) input control lead. For a DCE device, the input control lead is RDL. For a DTE device, the input control lead is RI.

                  This command is valid only for an RS-232 interface.

**Default**        off

**Parameters**    **on** — monitoring is enabled on the lead  
                  **off** — monitoring is disabled on the lead

## rts-dcd

**Syntax**        **rts-dcd {on | off}**

**Context**        config>port>serial>rs232>control-lead>monitor  
                  config>port>serial>v35>control-lead>monitor

**Description**    This command enables monitoring on the Request To Send (RTS) or Data Carrier Detect (DCD) input control lead. For a DCE device, the input control lead is RTS. For a DTE device, the input control lead is DCD.

                  This command is valid only for RS-232 and V.35 interfaces.

**Default**        off

**Parameters**    **on** — monitoring is enabled on the lead  
                  **off** — monitoring is disabled on the lead

## output

|                    |                                                                                                                     |
|--------------------|---------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>output</b>                                                                                                       |
| <b>Context</b>     | config>port>serial>rs232>control-lead<br>config>port>serial>v35>control-lead<br>config>port>serial>x21>control-lead |
| <b>Description</b> | This command enables access to the context to configure the output control leads.                                   |
| <b>Default</b>     | n/a                                                                                                                 |

## cts-alb

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>cts-alb {high   low   end-to-end}</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | config>port>serial>rs232>control-lead>output<br>config>port>serial>v35>control-lead>output                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | <p>This command configures the Clear To Send (CTS) or Analog Loopback (ALB) output control lead. The output signal that is sent depends on the <a href="#">device-gender</a> setting. For a DCE device, the output signal is CTS. For a DTE device, the output signal is ALB.</p> <p>This command is valid only for RS-232 and V.35 interfaces.</p>                                                                                                                                                                                                            |
| <b>Default</b>     | high                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Parameters</b>  | <p><b>high</b> — the output control lead is forced on</p> <p><b>low</b> — the output control lead is forced off</p> <p><b>end-to-end</b> — the output control lead follows that of the remote end, except when the output control lead is carrying a CTS signal on an RS-232 port operating at subrate speeds. In this case, the control lead follows the HCM status:</p> <ul style="list-style-type: none"> <li>• if the HCM status is Up, the CTS output control lead is 1</li> <li>• if the HCM status is Down, the CTS output control lead is 0</li> </ul> |

## dcd-rts

|                    |                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>dcd-rts {high   low   end-to-end}</b>                                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | config>port>serial>rs232>control-lead>output<br>config>port>serial>v35>control-lead>output                                                                                                                                                                                                                                                                |
| <b>Description</b> | <p>This command configures the Data Carrier Detect (DCD) or Request To Send (RTS) output control lead. The output signal that is sent depends on the <a href="#">device-gender</a> setting. For a DCE device, the output signal is DCD. For a DTE device, the output signal is RTS.</p> <p>This command is valid only for RS-232 and V.35 interfaces.</p> |



---

|                   |                                                                                                                                                                                        |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | high                                                                                                                                                                                   |
| <b>Parameters</b> | <b>high</b> — the output control lead is forced on<br><b>low</b> — the output control lead is forced off<br><b>end-to-end</b> — the output control lead follows that of the remote end |

## dsr-dtr

|                    |                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>dsr-dtr {high   low}</b>                                                                                                                                                                                                                                                                                                                               |
| <b>Context</b>     | config>port>serial>rs232>control-lead>output<br>config>port>serial>v35>control-lead>output                                                                                                                                                                                                                                                                |
| <b>Description</b> | <p>This command configures the Data Set Ready (DSR) or Data Terminal Ready (DTR) output control lead. The output signal that is sent depends on the <a href="#">device-gender</a> setting. For a DCE device, the outputs signal is DSR. For a DTE device, the output signal is DTR.</p> <p>This command is valid only for RS-232 and V.35 interfaces.</p> |
| <b>Default</b>     | high                                                                                                                                                                                                                                                                                                                                                      |
| <b>Parameters</b>  | <b>high</b> — the output control lead is forced on<br><b>low</b> — the output control lead is forced off                                                                                                                                                                                                                                                  |


## i-c

|                    |                                                                                                                                                                                                                                                                                                                         |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>i-c {high   low   end-to-end}</b>                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | config>port>serial>x21>control-lead>output                                                                                                                                                                                                                                                                              |
| <b>Description</b> | <p>This command configures the Indication (I) or Control (C) output control lead. The output signal that is sent depends on the <a href="#">device-gender</a> setting. For a DCE device, the output signal is I. For a DTE device, the output signal is C.</p> <p>This command is valid only for an X.21 interface.</p> |
| <b>Default</b>     | high                                                                                                                                                                                                                                                                                                                    |
| <b>Parameters</b>  | <b>high</b> — the output control lead is forced on<br><b>low</b> — the output control lead is forced off<br><b>end-to-end</b> — the output control lead follows that of the remote end                                                                                                                                  |

ri-rdl

|                    |                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>ri-rdl {high   low}</b>                                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | config>port>serial>rs232>control-lead>output                                                                                                                                                                                                                                                                                                        |
| <b>Description</b> | <p>This command configures the Ring Indicator (RI) or Remote Digital Loopback (RDL) output control lead. The output signal that is sent depends on the <a href="#">device-gender</a> setting. For a DCE device, the output signal is RI. For a DTE device, the output signal is RDL.</p> <p>This command is valid only for an RS-232 interface.</p> |
| <b>Default</b>     | high                                                                                                                                                                                                                                                                                                                                                |
| <b>Parameters</b>  | <b>high</b> — the output control lead is forced on<br><b>low</b> — the output control lead is forced off                                                                                                                                                                                                                                            |

data-position

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>data-position {F0-B5   F0-B6}</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | config>port>serial>rs232<br>config>port>serial>x21                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | <p>This command configures the HCM data start position for the RS-232 or X.21 interface.</p> <p>When <a href="#">s-bit-signaling</a> is on, the F0-B6 option is blocked. When the data position is set to F0-B6, S-bit signaling cannot be turned on.</p> <p>This command is only valid for ports configured for subrate speeds.</p> <div> <b>Note:</b> The HCM frame (10-row by 8-column matrix) cannot be displayed on the CLI.</div> |
| <b>Default</b>     | F0-B5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Parameters</b>  | <b>F0-B5</b> — HCM data start position is F0-B5<br><b>F0-B6</b> — HCM data start position is F0-B6                                                                                                                                                                                                                                                                                                                                                                                                                         |

---

## device-gender

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>device-gender {dte   dce}</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>port>serial>rs232<br>config>port>serial>v35<br>config>port>serial>x21                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Description</b> | <p>This command configures the gender of the device.</p> <p>Data and control signals are transmitted and received over wire pairs. The gender of a device indicates which wire in the pair is used to send and receive the signal.</p> <p>On SDI ports, the data and control signals are electrically wired as DCE. Regardless of the gender configured, the Tx pin on the port is always an input pin and the Rx pin on the port is always an output pin. Changing an SDI port from DCE to DTE does not change the pin orientation. Therefore, when a port is configured as DTE, a crossover cable is required in order to interconnect with some serial devices.</p> <p>If the port has been enabled for an RS-530 interface through the use of an adapter cable, only DCE operation is supported.</p> |
| <b>Default</b>     | dce                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Parameters</b>  | <b>dte</b> — the device is performing the role of the data terminal equipment<br><b>dce</b> — the device is performing the role of the data communications equipment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

## device-mode

|                    |                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>device-mode {synchronous   asynchronous}</b>                                                                                                                                                                                                                                                                                                                                   |
| <b>Context</b>     | config>port>serial>rs232<br>config>port>serial>v35<br>config>port>serial>x21                                                                                                                                                                                                                                                                                                      |
| <b>Description</b> | <p>This command configures the mode of operation for the device. An RS-232 or X.21 channel can be configured for either synchronous or asynchronous mode. Asynchronous mode is not supported on a V.35 channel; this channel can only be configured for synchronous mode.</p> <p>Asynchronous mode is supported only on channels with substrate speeds of 38 400 b/s or less.</p> |
| <b>Default</b>     | synchronous                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Parameters</b>  | <b>synchronous</b> — transmits data continuously based on timing<br><b>asynchronous</b> — transmits data one character at a time                                                                                                                                                                                                                                                  |

## duplex

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>duplex</b> { <b>half</b>   <b>full</b> }                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Context</b>     | config>port>serial>rs232<br>config>port>serial>v35<br>config>port>serial>x21                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b> | <p>This command configures the duplex mode. Half-duplex mode uses a single transmission path.</p> <p>Full-duplex mode uses two independent transmission paths, one in each direction, allowing two connected devices to transmit and receive data simultaneously.</p> <p>Half-duplex mode is not user-selectable; an error message is displayed if this option is selected. Half-duplex mode is selected automatically if multidrop data bridge (<a href="#">multi-drop</a>) is configured in slave mode (applies to RS-232 only).</p> |
| <b>Default</b>     | full                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Parameters</b>  | <p><b>half</b> — uses a single transmission path</p> <p><b>full</b> — uses two independent transmission paths, one in each direction</p>                                                                                                                                                                                                                                                                                                                                                                                               |

## hold-time

|                    |                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>hold-time</b> {[ <b>up</b> <i>hold-time-up</i> ] [ <b>down</b> <i>hold-time-down</i> ]}<br><b>no hold-time</b>                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | config>port>serial>rs232<br>config>port>serial>v35<br>config>port>serial>x21                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | This command configures the serial link dampening timers in 100s of milliseconds, which guards against reporting excessive interface transitions. Once implemented, subsequent transitions of the interface from one state to another are not advertised to upper layer protocols until the configured timer has expired.                                                                            |
| <b>Default</b>     | no hold-time                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Parameters</b>  | <p><i>hold-time-up</i> — the hold-timer for link-up event dampening. A value of zero (0) indicates that an up transition is reported immediately.</p> <p><b>Values</b> 0 to 100 (in 100 ms)</p> <p><i>hold-time-down</i> — the hold-timer for link-down event dampening. A value of zero (0) indicates that a down transition is reported immediately.</p> <p><b>Values</b> 0 to 100 (in 100 ms)</p> |

## loopback

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>loopback {<i>bidir-b</i>   <i>bidir-e</i>}</b><br><b>no loopback</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Context</b>     | config>port>serial>rs232<br>config>port>serial>v35<br>config>port>serial>x21                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Description</b> | <p>This command puts the specified interface into a loopback mode. The corresponding interface must be in a shutdown state in order for the loopback mode to be enabled.</p> <p>In the serial context, a bidirectional loopback B or E may be configured. A bidirectional loopback is a circuit loopback that loops traffic from the line back to the line and simultaneously loops traffic from the system back to the system. Bidirectional loopback B takes place on the control card (CSM) side of the adapter card, and is closer to the system. Loopback E takes place on the data device side of the adapter card, and is closer to the line.</p> <p>This command is not saved in the system configuration between boots.</p> <p>The <b>no</b> form of this command disables loopback on the interface.</p> |
| <b>Default</b>     | no loopback                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Parameters</b>  | <p><b>bidir-b</b> — bidirectional loopback B is closer to the system side of the adapter card</p> <p><b>bidir-e</b> — bidirectional loopback E is closer to the line side of the adapter card</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

## multi-drop

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>multi-drop {<i>disabled</i>   <i>slave</i>   <i>master</i>}</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | config>port>serial>rs232<br>config>port>serial>x21                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b> | <p>This command configures the multidrop data bridge (MDDB) mode. MDDB is a polling scheme used on SCADA networks (supervisory or control systems used in utility, oil and gas, and other vertical applications) to communicate with multiple remote terminal units (RTUs) over a single RS-232 or X.21 link.</p> <p>In an MDDB, several circuits take turns using the same bandwidth to communicate with one circuit. Each slave device transmits data in that bandwidth when requested by the master device. The master device sends polling messages to, and looks for data from, the slave devices in that bandwidth.</p> <p>One example of a multidrop data bridge is several terminals taking turns to communicate with a host computer. The circuit that all the other circuits communicate with is connected to a master device (a computer) and is designated the master; the rest of the circuits are connected to slave devices (terminals) and are designated slaves.</p> |

In a SCADA network, the 7705 SAR provides the communications infrastructure to connect the central masters to multiple RTUs at remote locations, where the masters and RTUs communicate over serial RS-232 or X.21 links (synchronous or asynchronous). The 7705 SAR-8 or 7705 SAR-18 located at the master site contains the Integrated Services card, which provides the MDDB bridge functionality and acts as the MDDB master. Remote 7705 SAR nodes connected to RTUs are referred to as MDDB slaves.

For both master and slave applications, the 7705 SAR must be physically connected to the SCADA device by one of the following:

- a 7705 SAR-8 or 7705 SAR-18 using the 12-port Serial Data Interface card (supports both RS-232 and X.21 links)
- a 7705 SAR-H using the 4-port T1/E1 and RS-232 Combination module (supports RS-232 links only)
- a 7705 SAR-Hc using an on-board RS-232 serial port (supports RS-232 links only)

The 12-port Serial Data Interface card also supports an RS-530/RS-422 interface with the use of an adapter cable that connects to a DB15 connector on the front of the X.21 distribution panel. There is no configuration specifically for the RS-530/RS-422 interface; configuration is done in X.21 mode and applies to the RS-530/RS-422 interface when it is physically enabled through hardware. For information about 12-port Serial Data Interface card adapter cables, see the 7705 SAR Serial Data Interface Card Installation Guide.

Multidrop data bridge is supported only at subrate speeds (less than 64kb/s) on X.21 interfaces.

When an RS-232 interface is configured as an MDDB slave, the duplex mode is automatically set to half-duplex and s-bit-signaling is forced off. When multidrop data bridge is disabled, the duplex mode is set back to the default of full-duplex and S-bit signaling is turned on (but can be set back to off).



**Note:** An X.21 interface configured as an MDDB slave does not change duplex mode; half-duplex is not supported on X.21.

When either an RS-232 or X.21 interface is configured as an MDDB master, the duplex mode is automatically set to full-duplex and S-bit signaling is forced off.

|            |                                                                                                                                                                      |
|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Default    | disabled                                                                                                                                                             |
| Parameters | <b>disabled</b> — MDDB mode is off<br><b>slave</b> — the port is operating as an MDDB slave device<br><b>master</b> — the port is operating as an MDDB master device |

## parity

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>parity</b> { <b>odd</b>   <b>even</b>   <b>mark</b>   <b>space</b> }<br><b>no parity</b>                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>port>serial>rs232<br>config>port>serial>x21                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | <p>This command configures the parity bit in a character. Parity is an error detection method that adds an extra bit to each character, based on the number of 0s or 1s in the character.</p> <p>This command is valid only if <a href="#">device-mode</a> is asynchronous. The value for this command must be no parity (that is, none) if the <a href="#">character-length</a> value is 8 and the <a href="#">stop-bits</a> value is 2.</p> <p>The <b>no</b> form of this command disables the parity bit in a character.</p> |
| <b>Default</b>     | no parity                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Parameters</b>  | <p><b>odd</b> — the parity bit set to 0 or 1 to make the total number of 1s in the set of bits odd</p> <p><b>even</b> — the parity bit set to 0 or 1 to make the total number of 1s in the set of bits even</p> <p><b>mark</b> — the parity bit is present but not used and always set to 1</p> <p><b>space</b> — the parity bit is present but not used and always set to 0</p>                                                                                                                                                |

## report-alarm

|                    |                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] report-alarm</b> [ <b>hcmOof</b>   <b>hcmRai</b> ]                                                                                                                                                                                                                                                                                               |
| <b>Context</b>     | config>port>serial>rs232<br>config>port>serial>x21                                                                                                                                                                                                                                                                                                       |
| <b>Description</b> | <p>This command enables logging of HCM alarms for RS-232 and X.21 interfaces. HCM alarms are not generated for V.35 interfaces because those interfaces do not operate at substrate speeds.</p> <p>The <b>no</b> form of this command disables the logging of the specified alarms.</p>                                                                  |
| <b>Parameters</b>  | <p><b>hcmOof</b> — reports local HCM out-of-frame errors. When configured, hcmOof events are raised and cleared.</p> <p><b>Default</b> HCM out-of-frame alarms are issued</p> <p><b>hcmRai</b> — reports remote HCM alarm indications. When configured, hcmRai events are raised and cleared.</p> <p><b>Default</b> HCM alarm indications are issued</p> |

## s-bit-signaling

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>s-bit-signaling</b> {on   off}                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>port>serial>rs232<br>config>port>serial>x21                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | <p>This command configures the S-bit signaling option on the RS-232 or X.21 interface.</p> <p>For RS-232 interfaces only, if <a href="#">multi-drop</a> is configured as slave or master, the system automatically turns S-bit signaling off. The signaling mode cannot then be changed. If <a href="#">multi-drop</a> is configured as disabled, the system automatically turns S-bit signaling on. When multi-drop is in disabled mode, S-bit signaling can be turned off or on.</p> <p>This command is only valid for ports configured for subrate speeds.</p> |
| <b>Default</b>     | on                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Parameters</b>  | <b>on</b> — enables S-bit signaling<br><b>off</b> — disables S-bit signaling                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

## socket

|                    |                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] socket</b> <i>socket-id</i>                                                                                                                                                                                                                                                                                                                |
| <b>Context</b>     | config>port>serial>rs232                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b> | <p>This command creates a socket on an RS-232 port. When a socket is configured, the RS-232 <a href="#">channel-group</a> command is blocked. If the port is already configured as a channel group before the socket is configured, this command is blocked.</p> <p>The <b>no</b> form of the command deletes the socket from the serial port.</p> |
| <b>Default</b>     | n/a                                                                                                                                                                                                                                                                                                                                                |
| <b>Parameters</b>  | <i>socket-id</i> — specifies the raw socket ID number                                                                                                                                                                                                                                                                                              |
| <b>Values</b>      | 1                                                                                                                                                                                                                                                                                                                                                  |

## encap-type

|                    |                                                                                                                                                                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>encap-type</b> <i>encap-type</i>                                                                                                                                                                                                                 |
| <b>Context</b>     | config>port>serial>rs232>socket                                                                                                                                                                                                                     |
| <b>Description</b> | <p>This command specifies the encapsulation type for a socket. When the encapsulation type is set, then the socket is considered operational and the port can be further configured as an IP transport subservice under an IES or VPRN service.</p> |



If the serial port has already been configured as an IES or VPRN IP transport subservice, then this command is blocked until the IP transport subservice is deconfigured.

**Default** raw

**Parameters** *encap-type* — specifies the encapsulation type to be used with the socket

**Values** raw

rx

**Syntax** rx

**Context** config>port>serial>rs232>socket

**Description** This command enables the context to configure parameters for data packets received over a serial port's raw socket.

eop

**Syntax** eop

**Context** config>port>serial>rs232>socket>rx

**Description** This command enables the context to configure end-of-packet (EOP) parameters for data packets received over the socket.



**Note:** An end of packet will be declared by whichever EOP condition is encountered first.

idle-timeout

**Syntax** idle-timeout *milliseconds*

**Context** config>port>serial>rs232>socket>rx>eop

**Description** This command specifies how long that a serial port can remain idle before an end of packet is declared and the packet is sent over the socket.

**Default** 50 ms

**Parameters** *time* — specifies the length of time, in milliseconds, that a queued packet can remain idle before an end of packet is declared

**Values** 10 to 5000

## length

|                    |                                                                                                                                                                                                                          |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>length</b> <i>bytes</i>                                                                                                                                                                                               |
| <b>Context</b>     | config>port>serial>rs232>socket>rx>eop                                                                                                                                                                                   |
| <b>Description</b> | This command specifies the number of characters (converted to bytes) received on the serial port that triggers the node to encapsulate the characters in an IP transport packet and send it over an IES or VPRN service. |
| <b>Default</b>     | 1500                                                                                                                                                                                                                     |
| <b>Parameters</b>  | <i>bytes</i> — the number of characters (in bytes) to trigger sending an IP transport packet                                                                                                                             |
|                    | <b>Values</b> 1 to 1500                                                                                                                                                                                                  |

## special-char

|                    |                                                                                                                                                                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>special-char</b> <i>value</i><br><b>no special-char</b>                                                                                                                                                                                              |
| <b>Context</b>     | config>port>serial>rs232>socket>rx>eop                                                                                                                                                                                                                  |
| <b>Description</b> | This command specifies a special character that, if received on the serial port, declares end of packet and triggers the node to encapsulate previously received queued characters into an IP transport packet and send it over an IES or VPRN service. |



**Note:** Other than declaring the end of packet, the special character is otherwise treated as regular data; that is, it is added to the packet.

The **no** form of the command disables checking for a special character.

|                   |                                                                                                                 |
|-------------------|-----------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | no special-char                                                                                                 |
| <b>Parameters</b> | <i>value</i> — specifies the special character, in a decimal or hexadecimal format, that triggers end of packet |
|                   | <b>Values</b> 0 to 255, or 0x00 to 0xFF                                                                         |

## squellch-delay

|                |                                                                  |
|----------------|------------------------------------------------------------------|
| <b>Syntax</b>  | <b>squellch-delay</b> <i>seconds</i><br><b>no squellch-delay</b> |
| <b>Context</b> | config>port>serial>rs232>socket>rx                               |

---

|                    |                                                                                                                                                                                                                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b> | <p>This command specifies how long a serial port can receive a continuous data stream before an alarm is raised indicating that the serial port has locked up and triggering the squelching function.</p> <p>The <b>no</b> form of the command disables the squelching function on the serial port.</p> |
| <b>Default</b>     | no squelch-delay                                                                                                                                                                                                                                                                                        |
| <b>Parameters</b>  | <p><i>seconds</i> — the number of seconds that a serial port can receive data before the squelching function is triggered</p> <p><b>Values</b> 1 to 120</p>                                                                                                                                             |

## squelch-reset

|                    |                                                                                                                                                                                                                                                                                                                       |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>squelch-reset</b>                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | config>port>serial>rs232>socket>rx                                                                                                                                                                                                                                                                                    |
| <b>Description</b> | <p>This command allows an operator to manually clear squelching on a serial port's raw socket without having to configure a time limit on the squelching function.</p> <p>Squelching can also be set to clear automatically after a time limit has been reached with the <a href="#">unsquelch-delay</a> command.</p> |
| <b>Default</b>     | n/a                                                                                                                                                                                                                                                                                                                   |

## unsquelch-delay

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>unsquelch-delay</b> <i>seconds</i><br><b>no unsquelch-delay</b>                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | config>port>serial>rs232>socket>rx                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Description</b> | <p>This command clears squelching on a raw socket by setting a limit on the amount of time that squelching can remain active on the port. When the time limit is reached, the auto-clear function is enabled and the serial port's raw socket is put back into a normal state.</p> <p>Squelching can be cleared manually with the <a href="#">squelch-reset</a> command.</p> <p>The <b>no</b> form of the command disables the auto-clear function on a serial port.</p> |
| <b>Default</b>     | no unsquelch-delay                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Parameters</b>  | <p><i>seconds</i> — the number of seconds before the auto-clear function is activated</p> <p><b>Values</b> 1 to 120</p>                                                                                                                                                                                                                                                                                                                                                  |

tx

|                    |                                                                                                                        |
|--------------------|------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>tx</b>                                                                                                              |
| <b>Context</b>     | config>port>serial>rs232>socket                                                                                        |
| <b>Description</b> | This command enables the context to configure parameters for data packets transmitted over a serial port's raw socket. |

inter-session-delay

|                    |                                                                                                                                                                                                                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>inter-session-delay</b> <i>milliseconds</i>                                                                                                                                                                                                                                                  |
| <b>Context</b>     | config>port>serial>rs232>socket>tx                                                                                                                                                                                                                                                              |
| <b>Description</b> | This command specifies a time delay that the node inserts between a session's data that is being transmitted over a serial port and the next queued session's data. The next session's data is not sent until the current session's data is sent and the <b>inter-session-delay</b> is reached. |
| <b>Default</b>     | 10 ms                                                                                                                                                                                                                                                                                           |
| <b>Parameters</b>  | <i>milliseconds</i> — the time delay, in milliseconds, between a session's data that is being transmitted over a serial port and the next queued session's data                                                                                                                                 |
| <b>Values</b>      | 0 to 5000                                                                                                                                                                                                                                                                                       |

speed

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>speed</b> {600   1200   2400   4800   9600   19200   38400   56000   57600   115200   64k   128k   256k   384k   512k   640k   768k   896k   1024k   1152k   1280k   1408k   1536k   1664k   1792k   1920k}                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>port>serial>rs232<br>config>port>serial>x21<br>config>port>serial>v35                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b> | <p>This command configures the speed of the interface. The speed also determines the DS0 timeslots assigned to the channel group.</p> <p>The 600 b/s value is valid for RS-232 interfaces only.</p> <p>For an RS-232 interface functioning as a raw socket, the maximum speed is 115 200 b/s; the 56 000 b/s value is not supported.</p> <p>For an RS-232 interface that is not functioning as a raw socket, the 57 000 b/s and 115 200 b/s values are not supported. The maximum supported speed is 56 000 b/s.</p> <p>X.21 interfaces support speeds from 1200 b/s to 1920 kb/s.</p> |

V.35 interfaces support speeds from 64 kb/s to 1920 kb/s. V.35 interfaces do not support subrate speeds.

Rates of 56000 b/s and greater are valid only if the [device-mode](#) is set to synchronous.

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | 9600 (RS-232)<br>64k (X.21 and V.35)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Parameters</b> | <b>600</b> — sets the link speed to 600 b/s<br><b>1200</b> — sets the link speed to 1200 b/s<br><b>2400</b> — sets the link speed to 2400 b/s<br><b>4800</b> — sets the link speed to 4800 b/s<br><b>9600</b> — sets the link speed to 9600 b/s<br><b>19200</b> — sets the link speed to 19 200 b/s<br><b>38400</b> — sets the link speed to 38 400 b/s<br><b>56000</b> — sets the link speed to 56 000 b/s (not supported on RS-232 raw sockets)<br><b>57600</b> — sets the link speed to 57 600 b/s (supported on RS-232 raw sockets only)<br><b>115200</b> — sets the link speed to 115 200 b/s (supported on RS-232 raw sockets only)<br><b>64k</b> — sets the link speed to 64 kb/s<br><b>128k</b> — sets the link speed to 128 kb/s<br><b>256k</b> — sets the link speed to 256 kb/s<br><b>384k</b> — sets the link speed to 384 kb/s<br><b>512k</b> — sets the link speed to 512 kb/s<br><b>640k</b> — sets the link speed to 640 kb/s<br><b>768k</b> — sets the link speed to 768 kb/s<br><b>896k</b> — sets the link speed to 896 kb/s<br><b>1024k</b> — sets the link speed to 1024 kb/s<br><b>1152k</b> — sets the link speed to 1152 kb/s<br><b>1280k</b> — sets the link speed to 1280 kb/s<br><b>1408k</b> — sets the link speed to 1408 kb/s<br><b>1536k</b> — sets the link speed to 1536 kb/s<br><b>1664k</b> — sets the link speed to 1664 kb/s<br><b>1792k</b> — sets the link speed to 1792 kb/s<br><b>1920k</b> — sets the link speed to 1920 kb/s |

---

## stop-bits

|                    |                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>stop-bits {1   2}</b>                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | config>port>serial>rs232<br>config>port>serial>x21                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | <p>This command configures the number of stop bits used to signify the end of a character.</p> <p>This command is valid only if the <a href="#">device-mode</a> is asynchronous.</p> <p>This command cannot have a value of 2 if the <a href="#">character-length</a> value is 8 and the <a href="#">parity</a> value is anything other than no parity (that is, anything other than none).</p> |
| <b>Default</b>     | 1                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Parameters</b>  | <p>1 — specifies one stop bit in a character</p> <p>2 — specifies two stop bits in a character</p>                                                                                                                                                                                                                                                                                              |

### 3.13.2.17 RS-232, V.35, and X.21 Channel Group Commands

#### channel-group

|                    |                                                                                                                        |
|--------------------|------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] channel-group</b> <i>channel-group-id</i>                                                                      |
| <b>Context</b>     | config>port>serial>rs232>channel-group<br>config>port>serial>v35>channel-group<br>config>port>serial>x21>channel-group |
| <b>Description</b> | This command creates a DS0 channel group on a channelized RS-232, V.35, or X.21 circuit.                               |



**Note:** When a socket is configured using the [socket](#) command, the RS-232 **channel-group** command is blocked.

Channel groups cannot be further subdivided.

The **no** form of this command deletes the specified RS-232, V.35, or X.21 channel group.

|                   |                                                                 |
|-------------------|-----------------------------------------------------------------|
| <b>Default</b>    | n/a                                                             |
| <b>Parameters</b> | <i>channel-group-id</i> — specifies the channel group ID number |
| <b>Values</b>     | RS-232: 1<br>V.35: 1<br>X.21: 1                                 |

#### crc

|                    |                                                                                                                                                                 |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>crc {16   32}</b>                                                                                                                                            |
| <b>Context</b>     | config>port>serial>rs232>channel-group<br>config>port>serial>v35>channel-group<br>config>port>serial>x21>channel-group                                          |
| <b>Description</b> | This command configures the precision of the cyclic redundancy check. The command is valid only if the <b>encap-type</b> is <b>frame-relay</b> or <b>ipcp</b> . |
| <b>Default</b>     | 16                                                                                                                                                              |
| <b>Parameters</b>  | <b>16</b> — a 16-bit checksum is used for the channel group<br><b>32</b> — a 32-bit checksum is used for the channel group                                      |

## encap-type

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>encap-type</b> { <b>cem</b>   <b>ipcp</b>   <b>frame-relay</b>   <b>hdlc</b>   <b>cisco-hdlc</b> }<br><b>no encap-type</b>                                                                                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | config>port>serial>rs232>channel-group<br>config>port>serial>v35>channel-group<br>config>port>serial>x21>channel-group                                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b> | <p>This command configures the encapsulation method used for the channel group.</p> <p>When <b>encap-type</b> is specified, the channel group must be deleted before <b>encap-type</b> can be changed.</p> <p>The <b>frame-relay</b>, <b>ipcp</b>, <b>hdlc</b>, and <b>cisco-hdlc</b> encapsulation types are not supported on the RS-232 interface or on ports with substrate speeds (below 64 kb/s).</p> <p>The <b>no</b> form of this command restores the default value.</p> |
| <b>Default</b>     | no encap-type                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Parameters</b>  | <p><b>cem</b> — specifies the encapsulation type as circuit emulation mode</p> <p><b>frame-relay</b> — specifies the encapsulation type as frame relay mode</p> <p><b>ipcp</b> — specifies the encapsulation type as ipcp mode for a PPP channel group in access mode</p> <p><b>hdlc</b> — specifies the encapsulation type as hdlc mode</p> <p><b>cisco-hdlc</b> — specifies the encapsulation type as cisco-hdlc mode</p>                                                      |

## idle-cycle-flag

|                    |                                                                                                                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>idle-cycle-flag</b> { <b>flags</b>   <b>ones</b> }<br><b>no idle-cycle-flag</b>                                                                                                           |
| <b>Context</b>     | config>port>serial>v35>channel-group<br>config>port>serial>x21>channel-group                                                                                                                 |
| <b>Description</b> | <p>This command defines the value to be transmitted by the channel group during its idle cycle. The command is valid only if the <b>encap-type</b> is <b>frame-relay</b> or <b>ipcp</b>.</p> |
| <b>Default</b>     | flags                                                                                                                                                                                        |
| <b>Parameters</b>  | <p><b>flags</b> — defines the 8-bit value to be transmitted as 01111110</p> <p><b>ones</b> — defines the 8-bit value to be transmitted as 11111111</p>                                       |



## idle-payload-fill

|                    |                                                                                                                                                                                                                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>idle-payload-fill</b> { <b>all-ones</b>   <b>pattern</b> <i>pattern</i> }<br><b>no idle-payload-fill</b>                                                                                                                                                                                        |
| <b>Context</b>     | config>port>serial>rs232>channel-group<br>config>port>serial>v35>channel-group<br>config>port>serial>x21>channel-group                                                                                                                                                                             |
| <b>Description</b> | This command defines the data pattern to be transmitted when the circuit emulation service is not operational or temporarily experiences underrun conditions.<br><br>This command is valid only if <b>encap-type</b> is cem.<br><br>The <b>no</b> form of this command restores the default value. |
| <b>Default</b>     | all ones                                                                                                                                                                                                                                                                                           |
| <b>Parameters</b>  | <b>all-ones</b> — defines the 8-bit value to be transmitted as 11111111<br><i>pattern</i> — defines the 8-bit value to be transmitted as a user-defined pattern (0 to 255)                                                                                                                         |

## mode

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mode</b> { <b>access</b>   <b>network</b> }                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Context</b>     | config>port>serial>rs232>channel-group<br>config>port>serial>v35>channel-group<br>config>port>serial>x21>channel-group                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b> | This command configures a serial port for access mode operation. Serial ports do not support network mode; if the user selects the network option, the CLI returns an error message.<br><br>An access port or channel is used for customer-facing traffic on which services are configured. SAPs can only be configured on an access port or channel. When a serial port is configured for access mode, multiple services can be configured on the port. |
| <b>Default</b>     | access                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Parameters</b>  | <b>access</b> — configures the serial channel as service access<br><b>network</b> — configures the serial channel for transport network use (not applicable)                                                                                                                                                                                                                                                                                             |

## mtu

|                    |                                                                                                                                                                         |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mtu</b> { <i>mtu-bytes</i> }<br><b>no mtu</b>                                                                                                                        |
| <b>Context</b>     | config>port>serial>v35>channel-group<br>config>port>serial>x21>channel-group                                                                                            |
| <b>Description</b> | This command defines the maximum MTU size that the channel group can support. The command is valid only if the <b>encap-type</b> is <b>frame-relay</b> or <b>ipcp</b> . |
| <b>Default</b>     | 1514 for frame relay<br>1502 for ipcp                                                                                                                                   |
| <b>Parameters</b>  | <i>mtu-bytes</i> — 578 to 2090                                                                                                                                          |

## ppp

|                    |                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] ppp</b>                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>port>serial>v35>channel-group<br>config>port>serial>x21>channel-group                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | This command enables access to the context to configure the LCP operational parameters for a V.35 or X.21 channel group. This command is available only if the <b>encap-type</b> is set to <b>ipcp</b> and therefore does not apply to RS-232 ports or to X.21 ports configured for subrate speeds.<br><br>The <b>no</b> form of the command removes the LCP operational parameters. |
| <b>Default</b>     | no ppp                                                                                                                                                                                                                                                                                                                                                                               |

## keepalive

|                    |                                                                                                                                                                                                                                                            |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>keepalive</b> <i>time-interval</i> [ <b>dropcount</b> <i>drop-count</i> ]<br><b>no keepalive</b>                                                                                                                                                        |
| <b>Context</b>     | config>port>serial>v35>channel-group>ppp<br>config>port>serial>x21>channel-group>ppp                                                                                                                                                                       |
| <b>Description</b> | This command enables the sending of keepalive messages and configures the time between messages and how many messages can be missed before the link is brought down.<br><br>The <b>no</b> form of this command disables the sending of keepalive messages. |
| <b>Default</b>     | keepalive 10 dropcount 3                                                                                                                                                                                                                                   |

|                   |                                                                                                                                                                    |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Parameters</b> | <i>time-interval</i> — the time, in seconds, between keepalive messages                                                                                            |
|                   | <b>Values</b> 1 to 60                                                                                                                                              |
|                   | <i>drop-count</i> — the number of consecutive failed keepalive request attempts or remote replies that can be missed before the link is operationally brought down |
|                   | <b>Values</b> 1 to 255                                                                                                                                             |

### 3.13.2.18 SONET/SDH Port Commands

#### sonet-sdh

|                    |                                                                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sonet-sdh</b>                                                                                                                                                                      |
| <b>Context</b>     | config>port                                                                                                                                                                           |
| <b>Description</b> | This command enables access to the context to configure SONET/SDH ports. This context can only be used when configuring an OC3/OC12 or STM1/STM4 port on an appropriate adapter card. |

#### clock-source

|                    |                                                                                                                                                                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>clock-source {loop-timed   node-timed}</b>                                                                                                                                                                                                   |
| <b>Context</b>     | config>port>sonet-sdh                                                                                                                                                                                                                           |
| <b>Description</b> | This command configures the clock for transmitted data from either the internal clock or from a clock recovered from the line's receive data stream.                                                                                            |
| <b>Default</b>     | node-timed                                                                                                                                                                                                                                      |
| <b>Parameters</b>  | <b>loop-timed</b> — the link recovers the clock from the received data stream. The 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card does not support loop timing.<br><b>node-timed</b> — the link uses the internal clock when transmitting data |

#### framing

|                    |                                                                                                                                                                                                   |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>framing {sonet   sdh}</b>                                                                                                                                                                      |
| <b>Context</b>     | config>port>sonet-sdh                                                                                                                                                                             |
| <b>Description</b> | This command specifies the SONET/SDH framing to be either SONET or SDH.<br><br>Changing the framing mode on the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card causes the adapter card to reset. |
| <b>Default</b>     | sonet                                                                                                                                                                                             |
| <b>Parameters</b>  | <b>sonet</b> — configures the port for SONET framing<br><b>sdh</b> — configures the port for SDH framing                                                                                          |

## group

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>group</b> <i>sonet-sdh-index</i> <b>payload</b> { <b>tu3</b>   <b>vt2</b>   <b>vt15</b> }                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>port>sonet-sdh                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | This command configures the SONET/SDH group payload on a 2-port OC3/STM1 Channelized Adapter card.                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Default</b>     | n/a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Parameters</b>  | <p><i>sonet-sdh-index</i> — specifies the components making a SONET/SDH path as configured by the <a href="#">path</a> command. Depending on the type of SONET/SDH port, the sonet-sdh-index must specify more path indexes to indicate the payload location of the path.</p> <p><b>tu3</b> — specifies the tributary unit group (TUG3) on a path and configures the port or channel for transport network use</p> <p><b>vt2</b> — configures the path as a vt2 type virtual tributary group</p> <p><b>vt15</b> — configures the path as a vt15 type virtual tributary group</p> |

## hold-time

|                    |                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>hold-time</b> {[ <b>up</b> <i>hold-time-up</i> ] [ <b>down</b> <i>hold-time-down</i> ]}<br><b>no hold-time</b>                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | config>port>sonet-sdh                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | This command configures SONET link dampening timers in 100s of milliseconds, to guard against reporting excessive interface transitions. Once implemented, subsequent transitions of the interface from one state to another are not advertised to upper layer protocols until the configured timer has expired.                                                                                     |
| <b>Default</b>     | no hold-time                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Parameters</b>  | <p><i>hold-time-up</i> — the hold-timer for link up event dampening. A value of zero (0) indicates that an up transition is reported immediately.</p> <p><b>Values</b> 0 to 100 (in 100 ms)</p> <p><i>hold-time-down</i> — the hold-timer for link down event dampening. A value of zero (0) indicates that a down transition is reported immediately.</p> <p><b>Values</b> 0 to 100 (in 100 ms)</p> |

## loopback

|                    |                                                                                                                                                                                                                      |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>loopback {line   internal}</b><br><b>no loopback</b>                                                                                                                                                              |
| <b>Context</b>     | config>port>sonet-sdh                                                                                                                                                                                                |
| <b>Description</b> | This command activates a loopback on the SONET/SDH port. The SONET port must be in a shutdown state to activate any type of loopback. The loopback setting is never saved to the generated/saved configuration file. |



**Note:** Loopback mode changes on a SONET/SDH port can affect traffic on the remaining ports.

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | no loopback                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Parameters</b> | <p><b>line</b> — sets the port into a line loopback state. A line loopback loops frames received on the corresponding port back towards the transmit (egress) direction. Line loopbacks are supported on ports configured in network mode.</p> <p><b>internal</b> — sets the port into an internal loopback state. An internal loopback loops the frames that are coming in an egress direction from the fabric towards the framer, back to the fabric. This type of loopback is usually referred to as an equipment loopback. Internal loopbacks are supported on ports configured in access mode.</p> |

## report-alarm

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] report-alarm [loc] [lais] [lrdi] [lb2er-sd] [lb2er-sf] [slof] [slos] [lrei]</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>port>sonet-sdh                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b> | <p>This command enables logging of SONET/SDH line and section alarms for a SONET/SDH port. When configured, logging is enabled for the raising and clearing of the specified alarms.</p> <p>The <b>no</b> form of this command disables logging of the specified alarms.</p>                                                                                                                                                                                                                                                                                                                            |
| <b>Parameters</b>  | <p><b>loc</b> — reports a loss of clock that causes the operational state of the port to be shut down</p> <p><b>Default</b>     loss of clock alarms are issued</p> <p><b>lais</b> — reports line alarm indication signal errors</p> <p><b>Default</b>     line alarm indication signal alarms are not issued</p> <p><b>lrdi</b> — reports line remote defect indication errors. Line remote defect indication errors are caused by remote loss of frame (LOF), loss of clock (LOC), and loss of signal (LOS) conditions.</p> <p><b>Default</b>     line remote defect indication alarms are issued</p> |

**lb2er-sd** — reports line signal degradation BER (bit interleaved parity) errors

**Default** line signal degradation BER alarms are not issued

**lb2er-sf** — reports line signal failure BER errors

**Default** line signal failure BER alarms are issued

**slof** — reports section loss of frame errors

**Default** section loss of frame alarms are issued

**slos** — reports a section loss of signal error on the transmit side

**Default** section loss of signal alarms are issued

**lrei** — reports a line error condition raised by the remote end as a result of b1 errors received from this node. When configured, line error alarms are raised but not cleared.

**Default** line error alarms are not issued

## section-trace

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>section-trace</b> { <b>increment-z0</b>   <b>byte</b> <i>value</i>   <b>string</b> <i>string</i> }                                                                                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | config>port>sonet-sdh                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b> | <p>This command configures the section trace bytes in the SONET section header to interoperate with some older versions of ADMs or regenerators that require an incremental STM ID. You can explicitly configure an incremental STM value rather than a static one in the SDH overhead by specifying an <b>increment-z0</b> value.</p> <p>The <b>increment-z0</b> parameter is not supported on the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card.</p> |
| <b>Default</b>     | byte 0x1                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Parameters</b>  | <p><b>increment-z0</b> — configures an incremental STM ID instead of a static value</p> <p><i>value</i> — sets values in SONET header bytes</p> <p><b>Values</b> 0 to 255 or 0x00 to 0xFF</p> <p><b>Default</b> 0x1</p> <p><i>string</i> — specifies a text string that identifies the section</p> <p><b>Values</b> a string up to 16 bytes</p>                                                                                                          |

## speed

|               |                                       |
|---------------|---------------------------------------|
| <b>Syntax</b> | <b>speed</b> {oc3}<br><b>no speed</b> |
|---------------|---------------------------------------|

---

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Context</b>     | config>port>sonet-sdh                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b> | <p>This command configures the speed of a SONET/SDH port. To change the port speed, the port must be administratively shut down and all channels must be removed. When the port speed is changed, the default channel configuration is recreated.</p> <p>This option is available, but may not be configured, since only one speed type is supported.</p> <p>The <b>no</b> form of this command reverts back to the default value.</p> |
| <b>Default</b>     | oc3                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Parameters</b>  | <b>oc3</b> — sets the speed of the port to OC3                                                                                                                                                                                                                                                                                                                                                                                         |

## threshold

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>threshold {ber-sd   ber-sf} rate threshold-rate</b><br><b>no threshold {ber-sd   ber-sf}</b>                                                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | config>port>sonet-sdh                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | <p>This command configures the line signal (b2) degradation bit error rate (BER) and line signal failure thresholds.</p> <p>Alarms are raised if the line signal bit interleaved parity error rates exceed either the degradation or failure thresholds. If the failure threshold is crossed, the link will be set to operationally down.</p> <p>The <b>no</b> form of this command reverts to the default value.</p> |
| <b>Default</b>     | <p>threshold ber-sd 6 - signal degrade BER threshold of <math>10^{-6}</math></p> <p>threshold ber-sf 3 - signal failure BER threshold of <math>10^{-3}</math></p>                                                                                                                                                                                                                                                     |
| <b>Parameters</b>  | <p><b>ber-sd</b> — specifies the BER for signal degradation</p> <p><b>ber-sf</b> — specifies the BER for signal failure</p> <p><i>threshold-rate</i> — specifies the BER negative exponent (n in <math>10^{-n}</math>), expressed as a decimal integer</p> <p><b>Values</b> 3 to 9 (<math>10^{-3}</math> to <math>10^{-9}</math>)</p>                                                                                 |

## tx-dus

|                |                       |
|----------------|-----------------------|
| <b>Syntax</b>  | <b>[no] tx-dus</b>    |
| <b>Context</b> | config>port>sonet-sdh |



|                    |                                                                                                                                                                                                                           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b> | This command allows the Quality Level (QL) value transmitted from the Synchronization Status Messaging (SSM) channel of a SONET/SDH port to be set to QL-DUS/QL-DNU (do not use for synchronization for timing purposes). |
| <b>Default</b>     | no tx-dus                                                                                                                                                                                                                 |

### 3.13.2.19 SONET/SDH Path Commands

#### path

|                    |                                                                                                                                                                                                                                                |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] path</b> [ <i>sonet-sdh-index</i> ]                                                                                                                                                                                                    |
| <b>Context</b>     | config>port>sonet-sdh                                                                                                                                                                                                                          |
| <b>Description</b> | This command defines the SONET/SDH path.<br><br>The <b>no</b> form of this command removes the specified SONET/SDH path.                                                                                                                       |
| <b>Default</b>     | no index                                                                                                                                                                                                                                       |
| <b>Parameters</b>  | <i>sonet-sdh-index</i> — specifies the components making up the specified SONET/SDH path<br>On the 4-port OC3/STM1 Clear Channel Adapter card, <i>sonet-sdh-index</i> is optional; if used, the value must be sts3.<br><b>Syntax:</b> sts1-x.x |

#### crc

|                    |                                                                                                                                                                                 |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>crc {16   32}</b>                                                                                                                                                            |
| <b>Context</b>     | config>port>sonet-sdh>path                                                                                                                                                      |
| <b>Description</b> | This command specifies a cyclic redundancy check on the SONET/SDH path on a 4-port OC3/STM1 Clear Channel Adapter card or 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card.      |
| <b>Default</b>     | 32 (if the <b>encap-type</b> is set to <b>atm</b> ; this default cannot be changed)<br><br>16 (if the <b>encap-type</b> is set to <b>ppp-auto</b> ; port is configured for POS) |
| <b>Parameters</b>  | <b>16</b> — specifies that a 16-bit checksum be used for the associated port/channel<br><b>32</b> — specifies that a 32-bit checksum be used for the associated port/channel    |

## encap-type

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>encap-type</b> {atm   ppp-auto}                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | config>port>sonet-sdh>path                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | <p>This command configures the encapsulation method used to distinguish customer traffic on a SONET/SDH path on a 4-port OC3/STM1 Clear Channel Adapter card.</p> <p>The <b>encap-type</b> of atm is used for access mode, and the <b>encap-type</b> of ppp-auto is used for network mode.</p> <p>When <b>encap-type</b> is atm, the <b>crc</b> default of 32 cannot be changed.</p> <p>When <b>encap-type</b> is atm, ATM sublayer verification specified in GR-1248-CORE, <i>Generic Requirements for Operations of ATM Network Elements</i>, is automatically enabled. The result of the verification includes:</p> <ul style="list-style-type: none"> <li>• Out of Cell Delineation (OCD) event count — the OCD event count is described in RFC 2515, <i>Definitions of Managed Objects for ATM Management</i>. Multiple events occurring within 1 s will be counted as one event for ATM and ASAP adapter cards as a result of a hardware limit.</li> <li>• Loss of Cell Delineation (LCD) defect/alarm — the LCD defect/alarm is defined in RFC 2515, <i>Definitions of Managed Objects for ATM Management</i>. When a path is in an LCD defect state, the path's operational status is down. When a path exits the LCD state, the path's operational status will change to up (assuming nothing else causes the path to stay down). A trap is raised to indicate the LCD status change, and a Path Remote Defect Indicator (PRDI) is sent to indicate the defect to the remote end.</li> </ul> <p>To change the <b>encap-type</b>, the <b>path</b> must first be removed and then recreated with the new <b>encap-type</b>. For example, to change the <b>encap-type</b> from atm to ppp-auto:</p> <pre>config&gt;port&gt;sonet-sdh&gt;path# back config&gt;port&gt;sonet-sdh# no path config&gt;port&gt;sonet-sdh# path config&gt;port&gt;sonet-sdh&gt;path# mode network config&gt;port&gt;sonet-sdh&gt;path# encap-type ppp-auto config&gt;port&gt;sonet-sdh&gt;path#</pre> |
| <b>Default</b>     | no encap-type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Parameters</b>  | <p><b>atm</b> — specifies that the encapsulation on the port is ATM</p> <p><b>ppp-auto</b> — enables PPP on the associated port or channel. The activation of IPCP and MPLSCP is automatic depending on the protocol configuration.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## mode

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mode</b> { <b>access</b>   <b>network</b> }                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>port>sonet-sdh>path                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Description</b> | <p>This command configures the mode of operation for a SONET/SDH port or channel on a 4-port OC3/STM1 Clear Channel Adapter card or 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card.</p> <p>An access port or channel is used for customer-facing traffic on which services are configured. A Service Access Point (SAP) can only be configured on an access port or channel. When a port or channel on the 4-port OC3/STM1 Clear Channel Adapter card is configured for access mode, the <b>encap-type</b> must be set to <b>atm</b>. The 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card does not support ATM when configured for access mode.</p> <p>A network port or channel configured for Packet over SONET (POS) is used as an uplink to connect to the packet network and transport the configured services. When a port or channel is configured for network mode, the <b>encap-type</b> must be set to <b>ppp-auto</b>.</p> <p>To change the mode, the <a href="#">path</a> must first be removed and then recreated with the new mode. For example, to change the <b>mode</b> from <b>access</b> to <b>network</b>:</p> <pre>config&gt;port&gt;sonet-sdh&gt;path# back config&gt;port&gt;sonet-sdh# no path config&gt;port&gt;sonet-sdh# path config&gt;port&gt;sonet-sdh&gt;path# mode network config&gt;port&gt;sonet-sdh&gt;path#</pre> |
| <b>Default</b>     | access                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Parameters</b>  | <p><b>access</b> — configures the port or channel for access mode</p> <p><b>network</b> — configures the port or channel for network mode</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

## mtu

|                    |                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mtu</b> <i>mtu</i><br><b>no mtu</b>                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>port>sonet-sdh>path                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | <p>This command configures the maximum payload MTU size for a SONET/SDH port on a 4-port OC3/STM1 Clear Channel Adapter card. When <b>encap-type</b> is <b>atm</b>, the path MTU value cannot be changed. Refer to the 7705 SAR Services Guide, “Global Service Command Reference”, for information on configuring the path MTU.</p> <p>The <b>no</b> form of this command restores the default value.</p> |
| <b>Default</b>     | 1524 (for access mode)                                                                                                                                                                                                                                                                                                                                                                                     |

1572 (for network mode)

**Parameters** *mtu* — sets the maximum allowable size of the MTU, expressed as an integer

**Values** 578 to 2090 (in bytes)

## payload

**Syntax** **payload** {**sts12** | **sts3** | **tug3** | **ds3** | **e3** | **vt2** | **vt15** | **ds1** | **e1**}

**Context** config>port>sonet-sdh>path

**Description** This command configures the SONET/SDH path on a 2-port OC3/STM1 Channelized Adapter card or 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card as an asynchronous circuit or a virtual tributary group. This command is only applicable to channelized adapter cards.

**Default** n/a

**Parameters** **sts12** — configures the STS12/STM4 payload as clear channel  
**sts3** — configures the STS3/STM1 payload as clear channel  
**tug3** — configures the STS3/STM1 payload as tributary unit group 3 (TUG3)  
**ds3** — configures the port or channel as D3 STS1/VC3  
**e3** — configures the VC3 payload as E3  
**vt2** — configures the path STS1 payload as virtual tributary group 2  
**vt15** — configures the path as virtual tributary group 15  
**ds1** — configures the port or channel VT15 or VT2 payload as DS1  
**e1** — configures the VT2 payload as E1

## ppp

**Syntax** **ppp**

**Context** config>port>sonet-sdh>path

**Description** This command enables access to the context to configure the Link Control Protocol (LCP) operational parameters for a Packet over Sonet (POS) Point-to-Point Protocol (PPP) link on a 4-port OC3/STM1 Clear Channel Adapter card.

**Default** n/a

## keepalive

|                    |                                                                                                                                                                                                                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>keepalive</b> <i>time-interval</i> [ <b>dropcount</b> <i>drop-count</i> ]<br><b>no keepalive</b>                                                                                                                                                                                                       |
| <b>Context</b>     | config>port>sonet-sdh>path>ppp                                                                                                                                                                                                                                                                            |
| <b>Description</b> | This command enables the sending of keepalive echo messages on a 4-port OC3/STM1 Clear Channel Adapter card and configures the time between messages and how many reports can be missed before the link is brought down.<br><br>The <b>no</b> form of this command disables the sending of echo requests. |
| <b>Default</b>     | keepalive 10 dropcount 3                                                                                                                                                                                                                                                                                  |
| <b>Parameters</b>  | <i>time-interval</i> — the time interval, in seconds, that echo requests are issued<br><br><b>Values</b> 1 to 60<br><b>Default</b> 10<br><br><i>drop-count</i> — the number of keepalive messages that can be missed before the link is brought down<br><br><b>Values</b> 1 to 255<br><b>Default</b> 3    |

## report-alarm

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | [ <b>no</b> ] <b>report-alarm</b> [ <b>pais</b> ] [ <b>plop</b> ] [ <b>prdi</b> ] [ <b>pplm</b> ] [ <b>prei</b> ] [ <b>puneq</b> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Context</b>     | config>port>sonet-sdh>path                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | This command enables logging of SONET/SDH path alarms for a SONET/SDH port.<br><br>The <b>no</b> form of this command disables logging of the specified alarms.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Parameters</b>  | <b>pais</b> — reports path alarm indication signal errors. When configured, path alarm indication signal alarms are raised and cleared.<br><b>Default</b> path alarm indication signal alarms are not issued<br><br><b>plop</b> — reports path loss of pointer errors, per tributary. When configured, path loss of pointer alarms are raised but not cleared.<br><b>Default</b> path loss of pointer alarms are issued<br><br><b>prdi</b> — reports path remote defect indication errors. When configured, path remote defect indication alarms are raised and cleared.<br><b>Default</b> path remote defect indication alarms are not issued |

**pplm** — reports a path payload mismatch, which places the channel operationally down. When configured, path payload mismatch alarms are raised but not cleared.

**Default** path payload mismatch alarms are issued

**prei** — reports a path error condition raised by the remote end as a result of b3 errors received from this node. When configured, path error alarms are raised but not cleared. (This parameter is not supported on the 4-port OC3/STM1 card.)

**Default** path error alarms are not issued

**puneq** — reports path unequipped errors

**Default** path unequipped alarms are issued

## scramble

**Syntax** [no] **scramble**

**Context** config>port>sonet-sdh>path

**Description** This command enables SONET/SDH payload scrambling on a 4-port OC3/STM1 Clear Channel Adapter card.

Scrambling randomizes the pattern of 1s and 0s carried in a SONET frame. Scrambling, or rearranging, the pattern prevents continuous strings of all 1s or all 0s and meets the needs of physical layer protocols that rely on sufficient transitions between 1s and 0s to maintain clocking.

For ATM, this command enables or disables ATM cell-level payload scrambling or descrambling using the  $x^{43}+1$  polynomial as defined in ITU-T I.432.1. Scrambling is enabled by default for the ATM path or channel. This scrambling is done in addition to SONET/SDH frame scrambling or descrambling, which is always enabled in the framer.

The **no** form of this command disables scrambling.

**Default** scramble

## signal-label

**Syntax** **signal-label** *value*  
**no signal-label**

**Context** config>port>sonet-sdh>path

**Description** This command sets the C2 byte value. The purpose of this byte is to communicate the payload type being encapsulated by SONET framing.

**Default** 0xcf

---

|                   |                                                                                                   |
|-------------------|---------------------------------------------------------------------------------------------------|
| <b>Parameters</b> | <i>value</i> — specifies the C2 byte value, expressed as a decimal integer or a hexadecimal value |
| <b>Values</b>     | 1 to 254 or 0x01 to 0xfe                                                                          |

trace-string

|                    |                                                                                                                                                                                                                                                                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>trace-string</b> [ <i>trace-string</i> ]<br><b>no trace-string</b>                                                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>port>sonet-sdh>path                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | <p>This command specifies that a J1-path-trace that identifies the circuit be continuously inserted at source. The specified trace string can be checked against the expected value by the receiver. If no trace string is entered, a null string is used.</p> <p>The <b>no</b> form of this command resets the string to its default.</p> |
| <b>Default</b>     | The default J1 value is ALU 7705 SAR. The value does not change when the <b>encap-type</b> changes. The J1 string contains all zeros for a non-provisioned path.                                                                                                                                                                           |
| <b>Parameters</b>  | <i>trace-string</i> — specifies an alphanumeric string value. If the string contains spaces, enclose it in quotation marks.                                                                                                                                                                                                                |
| <b>Values</b>      | 1 to 62 bytes for SONET or 1 to 15 bytes for SDH                                                                                                                                                                                                                                                                                           |



### 3.13.2.20 Network Port Commands

#### network

|                    |                                                                                                                                                                                                                                                                            |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>network</b>                                                                                                                                                                                                                                                             |
| <b>Context</b>     | <pre>config&gt;port&gt;dsl config&gt;port&gt;ethernet config&gt;port&gt;gpon config&gt;port&gt;sonet-sdh&gt;path config&gt;port&gt;tdm&gt;ds1&gt;channel-group config&gt;port&gt;tdm&gt;ds3 config&gt;port&gt;tdm&gt;e1&gt;channel-group config&gt;port&gt;tdm&gt;e3</pre> |
| <b>Description</b> | This command enables access to the context to configure network port parameters.                                                                                                                                                                                           |
| <b>Default</b>     | n/a                                                                                                                                                                                                                                                                        |

#### accounting-policy

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>accounting-policy</b> <i>policy-id</i><br><b>no accounting-policy</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | <pre>config&gt;port&gt;dsl&gt;network config&gt;port&gt;ethernet&gt;network config&gt;port&gt;gpon&gt;network config&gt;port&gt;sonet-sdh&gt;path&gt;network config&gt;port&gt;tdm&gt;ds1&gt;channel-group&gt;network config&gt;port&gt;tdm&gt;ds3&gt;network config&gt;port&gt;tdm&gt;e1&gt;channel-group&gt;network config&gt;port&gt;tdm&gt;e3&gt;network</pre>                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | <p>This command configures an accounting policy that can apply to an interface.</p> <p>An accounting policy must be configured before it can be associated to an interface. If the accounting <i>policy-id</i> does not exist, an error is returned.</p> <p>Accounting policies associated with service billing can only be applied to SAPs. Accounting policies associated with network ports can only be associated with interfaces. Only one accounting policy can be associated with an interface at a time.</p> <p>No accounting policies are specified by default. You must explicitly specify a policy. If configured, the accounting policy configured as the default under the <b>config&gt;log&gt;accounting-policy&gt;default</b> command is used.</p> |

The **no** form of this command removes the accounting policy association from the network interface, and the accounting policy reverts to the default.

**Default** n/a

**Parameters** *policy-id* — specifies the accounting *policy-id* of an existing policy. Accounting policies record either service (access) or network information. A network accounting policy can only be associated with the network port configurations. Accounting policies are configured in the **config>log>accounting-policy** context.

**Values** 1 to 99

## collect-stats

**Syntax** [**no**] **collect-stats**

**Context** config>port>dsl>network  
 config>port>ethernet>network  
 config>port>gpon>network  
 config>port>sonet-sdh>path>network  
 config>port>tdm>ds1>channel-group>network  
 config>port>tdm>ds3>network  
 config>port>tdm>e1>channel-group>network  
 config>port>tdm>e3>network

**Description** This command enables the collection of accounting and statistical data for the network interface. When applying accounting policies, the data, by default, is collected in the appropriate records and written to the designated billing file.

When the **no collect-stats** command is issued, the statistics are still accumulated by the adapter cards. However, the CPU does not obtain the results and write them to the billing file. If the **collect-stats** command is issued again (enabled), then the counters written to the billing file will include the traffic collected while the **no collect-stats** command was in effect.

**Default** no collect-stats

## egress


**Syntax** **egress**

**Context** config>port>ethernet>network

**Description** This command enables access to the context to assign network egress parameters.

**Default** n/a

## shaper-policy

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>shaper-policy</b> <i>name</i><br><b>no shaper-policy</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>port>ethernet>network>egress                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Description</b> | <p>This command assigns a shaper policy to the specified port.</p> <p>The shaper policy defines shaper parameters such as shaper group, and PIR and CIR rates. The shaper policy is defined in the <b>config&gt;qos&gt;shaper-policy</b> context. Refer to the 7705 SAR Quality of Service Guide, “QoS for Hybrid Ports”, for more information.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                    | <p> <b>Note:</b></p> <ul style="list-style-type: none"> <li>• The port shaper rate applies to the bulk of access and network traffic. Thus, once the configured egress shaper rate is reached, both the access and network traffic scheduling pauses.</li> <li>• For hybrid ports, there can be a single shaper policy on access egress and a single shaper policy on network egress. Therefore, all the SAP traffic and all the network traffic is each bound to its own shaper group in the shaper policy (access and network shaper policy, respectively). In other words, shaped SAPs and the bulk/aggregate of unshaped SAPs are shaped together as per the shaper policy assigned to the access egress. A similar behavior applies to network traffic, where the shaped interfaces and the bulk/aggregate of unshaped interfaces are shaped together as per the shaper policy assigned to the network egress.</li> </ul> |
|                    | The <b>no</b> form of this command reverts to the default.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Default</b>     | “default”                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Parameters</b>  | <i>name</i> — specifies an existing shaper policy name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

## unshaped-if-cir

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>unshaped-if-cir</b> <i>cir-rate</i><br><b>no unshaped-if-cir</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>port>ethernet>network>egress                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | <p>This command sets the CIR rate for the aggregate of all the unshaped VLANs (that is, network interfaces) on the port. The default <i>cir-rate</i> is 0 kb/s. When the <i>cir-rate</i> is set to <b>max</b>, the CIR rate adopts the maximum rate of the port. The actual rate of the port is dictated by the physical port speed, which can be overwritten by the <a href="#">egress-rate sub-rate</a> command.</p> <p>If the <i>cir-rate</i> is higher than the <i>sub-rate</i>, the <i>cir-rate</i> is stored in the configuration database but the <i>sub-rate</i> limit is used.</p> |

On Gen-3 hardware, the *cir-rate* for this command can be configured and is applied but has no effect on the network port, except for network traffic in hybrid mode, where the *cir-rate* value has an effect.

On the 8-port Ethernet Adapter card, version 2, shaped and unshaped VLANs are arbitrated towards the port but the [egress-rate](#) cannot be enabled.

The **no** form of the command sets the **unshaped-if-cir** CIR rate to 0 kb/s.

|                   |                                                                                        |
|-------------------|----------------------------------------------------------------------------------------|
| <b>Default</b>    | no unshaped-if-cir                                                                     |
| <b>Parameters</b> | <i>cir-rate</i> — the CIR rate for the aggregate of all the unshaped VLANs on the port |
| <b>Values</b>     | 0 to 10000000 kb/s, or max                                                             |
| <b>Default</b>    | 0 kb/s                                                                                 |

## queue-policy

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>queue-policy</b> <i>name</i><br><b>no queue-policy</b>                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>port>dsl>network<br>config>port>ethernet>network<br>config>port>gpon>network<br>config>port>sonet-sdh>path>network<br>config>port>tdm>ds1>channel-group>network<br>config>port>tdm>ds3>network<br>config>port>tdm>e1>channel-group>network<br>config>port>tdm>e3>network                                                                                                                                                               |
| <b>Description</b> | This command specifies the network queue policy that defines queue parameters such as CBS-priority-only burst size, MBS, CIR, and PIR rates, as well as FC-to-queue mappings. The network queue policy is defined in the <b>config&gt;qos&gt;network-queue</b> context. Refer to the 7705 SAR Quality of Service Guide, “Network Queue QoS Policies”, for more information.<br><br>The <b>no</b> form of this command reverts to the default. |
| <b>Default</b>     | “default”                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Parameters</b>  | <i>name</i> — specifies an existing network queue policy name                                                                                                                                                                                                                                                                                                                                                                                 |

## scheduler-mode

|                    |                                                                                   |
|--------------------|-----------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>scheduler-mode</b> { <b>profile</b>   <b>4-priority</b>   <b>16-priority</b> } |
| <b>Context</b>     | config>port>ethernet>network                                                      |
| <b>Description</b> | This command selects the network-side scheduling option for the following:        |

- 8-port Ethernet Adapter card
- 8-port Gigabit Ethernet Adapter card
- Packet Microwave Adapter card
- 10-port 1GigE/1-port 10GigE X-Adapter card
- 2-port 10GigE (Ethernet) Adapter card
- 2-port 10GigE (Ethernet) module
- Ethernet ports on the 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-M, 7705 SAR-W, and 7705 SAR-Wx

On the 6-port Ethernet 10Gbps Adapter card and the 7705 SAR-X, **scheduler-mode** is permanently set to support 4-priority and is not user-configurable.

With profiled (or rate-based) scheduling, both in-profile and out-of-profile scheduling are supported. Packets with a flow rate that is less than or equal to the CIR value of a queue are scheduled as in-profile. Packets with a flow rate that exceeds the CIR value but is less than the PIR value of a queue are scheduled as out-of-profile. In-profile traffic has strict priority over out-of-profile traffic.

Profiled scheduling does not take queue type into consideration. With queue type-based scheduling, queues are divided into two categories – those that are serviced by the Expedited scheduler and those that are serviced by the Best Effort scheduler. The Expedited scheduler has precedence over the Best Effort scheduler.

Four-priority scheduling combines both profiled and queue type-based scheduling. The combination provides four scheduling priorities. Packets are scheduled in the following order, in strict priority fashion:

- Expedited in-profile packets
- Best-effort in-profile packets
- Expedited out-of-profile packets
- Best-effort out-of-profile packets



**Note:** 16-priority is the default scheduling option on the 8-port Gigabit Ethernet Adapter card, 10-port 1GigE/1-port 10GigE X-Adapter card, 2-port 10GigE (Ethernet) Adapter card, 2-port 10GigE (Ethernet) module, Packet Microwave Adapter card, 7705 SAR-M, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-W, and 7705 SAR-Wx Ethernet ports. These cards, modules, and ports support 16-priority scheduling, but not profiled or 4-priority scheduling. In addition, 16-priority scheduling is not supported on the 8-port Ethernet card. For information on 16-priority scheduling, refer to the 7705 SAR Quality of Service Guide, “QoS Policies”.

**Default**      profile —8-port Ethernet Adapter card

---

16-priority —8-port Gigabit Ethernet Adapter card, 10-port 1GigE/1-port 10GigE X-Adapter card, 2-port 10GigE (Ethernet) Adapter card, 2-port 10GigE (Ethernet) module, Packet Microwave Adapter card, 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-M, 7705 SAR-W, and 7705 SAR-Wx Ethernet ports (cannot be changed)

**Parameters**    **profile** — sets the profiled scheduling option for the 8-port Ethernet Adapter card

**4-priority** — sets the 4-priority scheduling option for the 8-port Ethernet Adapter card

**16-priority** — sets the 16-priority scheduling option for the 8-port Gigabit Ethernet Adapter card, 10-port 1GigE/1-port 10GigE X-Adapter card, 2-port 10GigE (Ethernet) Adapter card, 2-port 10GigE (Ethernet) module, Packet Microwave Adapter card, 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-M, 7705 SAR-W, and 7705 SAR-Wx Ethernet ports

### 3.13.2.21 Multilink Bundle and IMA Group Commands



**Note:** Unless otherwise specified, references to multilink bundles refer to both multilink (MLPPP) bundles and IMA groups.

#### multilink-bundle

|                    |                                                                                       |
|--------------------|---------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] multilink-bundle</b>                                                          |
| <b>Context</b>     | config>port                                                                           |
| <b>Description</b> | This command enables the context to configure bundle properties for this bundle port. |
| <b>Default</b>     | n/a                                                                                   |

#### fragment-threshold

|                    |                                                                                                                                                                                                                                                                                                            |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>fragment-threshold</b> <i>fragment-threshold</i><br><b>no fragment-threshold</b>                                                                                                                                                                                                                        |
| <b>Context</b>     | config>port>multilink-bundle                                                                                                                                                                                                                                                                               |
| <b>Description</b> | <p>This command sets the maximum length (in bytes) of a fragment transmitted across the specified MLPPP bundle or sets the length of a Tx frame across the specified IMA group bundle in ATM cells.</p> <p>The <b>no</b> form of this command resets the fragment threshold back to the default value.</p> |
| <b>Default</b>     | 128                                                                                                                                                                                                                                                                                                        |
| <b>Parameters</b>  | <p><i>fragment-threshold</i> — specifies the maximum fragment length in bytes (for MLPPP bundles) or the Tx frame size (for IMA bundles)</p> <p><b>Values</b>      128 to 512 bytes (MLPPP)<br/>                 128 bytes (IMA)</p>                                                                       |

## member

|                    |                                                           |
|--------------------|-----------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] member</b> <i>port-id</i>                         |
| <b>Context</b>     | config>port>multilink-bundle                              |
| <b>Description</b> | This command binds a channel group to a multilink bundle. |

To bind a channel group to a multilink bundle, all the timeslots on the channel group must be allocated.

When you configure a channel group on the network side with ppp-auto encapsulation, the system automatically allocates all timeslots to the channel group. When you configure a channel group on the access side with IPCP encapsulation, the system does not automatically allocate all timeslots to the channel group. In order to use the port or channel group as a member in an multilink bundle, you must manually allocate all the timeslots to the channel group before adding it to the bundle.

The following lists the cards, modules, and platforms that support multilink bundles and the number of channel groups on the network and/or access side that can be bound to an MLPPP bundle:

- T1/E1 ports on the 7705 SAR-A (variants with T1/E1 ports)  
Network: 8 Access: 8
- T1/E1 ports on the 7705 SAR-M (variants with T1/E1 ports)  
Network: 16 Access: 8
- T1/E1 ports on the 7705 SAR-X  
Network: 8 Access: 8

The following must have all member links of an MLPPP bundle configured on the same card or module:

- 16-port T1/E1 ASAP Adapter card  
Network: 16 Access: 8
- 32-port T1/E1 ASAP Adapter card  
Network: 16 Access: 8
- T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module (on 7705 SAR-H)  
Network: 2 Access: 2

The following must have all member links of an MLPPP bundle configured on the same card or module, and on the same port:

- 2-port OC3/STM1 Channelized Adapter card  
Network: 8 Access: 8
- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card  
Network: 8 Access: 8



The following lists the cards, modules, and platforms that support IMA groups and the number of channel groups on the network and/or access side that can be bound to an IMA group:

- T1/E1 ports on the 7705 SAR-M (variants with T1/E1 ports)  
IMA: 16  
The following must have all member links of an IMA bundle configured on the same card or module:
  - 16-port T1/E1 ASAP Adapter card  
IMA: 16
  - 32-port T1/E1 ASAP Adapter card  
IMA: 16The following must have all member links of an IMA bundle configured on the same card or module, and on the same port:
  - 2-port OC3/STM1 Channelized Adapter card  
IMA: 8

The **no** form of this command removes the specified channel group from the multilink bundle.

**Default** n/a

**Parameters** *port-id* — the physical port ID  
**Syntax:** slot/mda/port.channel

minimum-links

**Syntax** **minimum-links** *minimum-links*  
**no minimum-links**

**Context** config>port>multilink-bundle

**Description** This command sets the minimum number of links that must be active for the bundle to be active.

If the number of active links drops below the configured minimum, then the multilink bundle will transition to an operationally down state.

The **no** form of this command removes the minimum link limit.

**Default** 1

**Parameters** *minimum-links* — the minimum link limit, expressed as an integer

Values

|                                                           | MLPP Bundles |         | IMA Bundles |
|-----------------------------------------------------------|--------------|---------|-------------|
|                                                           | Access       | Network | Access      |
| T1/E1 ports on the 7705 SAR-A (variants with T1/E1 ports) | 1 to 8       | 1 to 8  | —           |

|                                                                               | MLPP Bundles |         | IMA Bundles |
|-------------------------------------------------------------------------------|--------------|---------|-------------|
|                                                                               | Access       | Network | Access      |
| T1/E1 ports on the 7705 SAR-M (variants with T1/E1 ports)                     | 1 to 8       | 1 to 16 | 1 to 16     |
| T1/E1 ports on the 7705 SAR-X                                                 | 1 to 8       | 1 to 8  | —           |
| T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module (on 7705 SAR-H) | 1 to 2       | 1 to 2  | —           |
| DS1/E1 channels on the 2-port OC3/STM1 Channelized Adapter card               | 1 to 8       | 1 to 8  | 1 to 8      |
| 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card                               | —            | 1 to 8  | —           |
| 16-port T1/E1 ASAP Adapter card                                               | 1 to 8       | 1 to 16 | 1 to 16     |
| 32-port T1/E1 ASAP Adapter card                                               | 1 to 8       | 1 to 16 | 1 to 16     |

## mlppp

|                    |                                                                        |
|--------------------|------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mlppp</b>                                                           |
| <b>Context</b>     | config>port>multilink-bundle                                           |
| <b>Description</b> | This command enables the context to configure MLPPP bundle attributes. |

## endpoint-discriminator

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>endpoint-discriminator class {ip-address   global-mac-address   null} [discriminator-id discriminator-id]</b><br><b>no endpoint-discriminator</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | config>port>multilink-bundle>mlppp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b> | <p>This command configures the endpoint-discriminator class and ID. The port must be shut down to modify the endpoint-discriminator parameters.</p> <p>If the <b>null</b> option is configured, the 7705 SAR will advertise an endpoint-discriminator class value of NULL in link membership negotiations. If the far-end node rejects the NULL object, the 7705 SAR will remove the object from future requests. The <b>null</b> option should only be used if the far-end node cannot support the <b>ip-address</b> or <b>global-mac-address</b> endpoint-discriminator class options, as these options provide more protection from incorrectly adding a link to an MLPPP bundle.</p> <p>The <b>no</b> form of this command removes the configured parameters.</p> |
| <b>Parameters</b>  | <p><b>class</b> — specifies the link control protocol endpoint-discriminator class field</p> <p><b>Default</b>      global-mac-address (for physical MLPPP bundle)<br/>                    ip-address (for physical MLPPP bundle protection group)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

null (when the endpoint-discriminator option is not present in a received configure request)

*discriminator-id* — specifies the endpoint-discriminator identifier value within the specified endpoint-discriminator class

**Values** any valid IP address

## magic-number

**Syntax** [no] magic-number

**Context** config>port>multilink-bundle>mlppp

**Description** This command allows loopback detection to be enabled and disabled for MLPPP bundles. The command is disabled by default. When the magic number option is disabled, the magic number option will not be requested when a member is trying to bring up the LCP layer on a member link; if the remote peer requests this option, it will be rejected. When transmitting echo-requests, a magic number of 0 is used. When responding to echo-requests, a magic number of 0 is sent.

If the magic-number option is enabled, the option is sent to the remote peer during protocol negotiation. If this option is rejected by the remote peer, the router will bring the link up but will be unable to detect loopbacks since the router will always send a magic number of 0 in the echo messages upon rejection. If this option is accepted by the remote peer, the router will send echo messages with randomly generated (non-zero) magic numbers. If the 7705 SAR receives a config-req with the same magic number that was sent out, the router will calculate a new magic number to use and send out another config-request. If the router persistently sees the randomly generated magic number in the received config-req, the router will declare a loopback.

The **no** form of the command disables the loopback detection.

**Default** no magic-number

## multiclass

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>multiclass</b> <i>count</i><br><b>no multiclass</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>port>multilink-bundle>mlppp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | <p>This command enables multi-class MLPPP (MC-MLPPP) as defined by RFC 2686, <i>The Multi-Class Extension to Multi-Link PPP</i>. The 7705 SAR supports MC-MLPPP bundles with 2, 3 or 4 classes. To change the number of classes, all member links must be removed and then the bundle must be shut down.</p> <p>The packets transmitted on the MC-MLPPP bundle are sent with class values from 0 to one less than the configured class size. For example, a 4-class MLPPP bundle has 4 classes and transmits packets with class numbers 0, 1, 2, and 3. A 4-class bundle transmits packets with class numbers 0, 1 and 2 and a 2-class bundle transmits packets with class numbers 0 and 1. A 0-class MLPPP bundle has the highest priority.</p> <p>Entries are created and deleted by the system depending on the number of classes being used by a given MLPPP bundle. The <b>no</b> form of the command disables multi-class MLPPP.</p> |
| <b>Default</b>     | no multiclass                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Parameters</b>  | <i>count</i> — specifies the number of classes in an MLPPP bundle                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                    | <b>Values</b> 2 to 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

## mrru

|                    |                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mrru</b> <i>mrru</i><br><b>no mrru</b>                                                                                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | config>port>multilink-bundle                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b> | <p>This command specifies the maximum received reconstructed unit (MRRU), which is similar to a maximum transmission unit (MTU) but applies only to MLPPP multilink bundles. The MRRU is the maximum frame size that can be reconstructed from multilink fragments. This command is only valid for MLPPP bundles.</p> <p>The <b>no</b> form of this command resets the MRRU to the default.</p> |
| <b>Default</b>     | 1524                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Parameters</b>  | <i>mrru</i> — the maximum received reconstructed unit size, expressed as an integer                                                                                                                                                                                                                                                                                                             |
|                    | <b>Values</b> 1500 to 2088 bytes (for MLPPP)<br>1500 to 2090 bytes (for PPP)                                                                                                                                                                                                                                                                                                                    |

## red-differential-delay

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |               |                                                                                                                                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>red-differential-delay</b> <i>red-diff-delay</i> [ <b>down</b> ]<br><b>no red-differential-delay</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |                                                                                                                                                                                                                     |
| <b>Context</b>     | config>port>multilink-bundle                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |               |                                                                                                                                                                                                                     |
| <b>Description</b> | This command sets the maximum acceptable differential delay for individual circuits within a multilink bundle.<br><br>The <b>no</b> form of this command restores the red-differential-delay defaults.                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |               |                                                                                                                                                                                                                     |
| <b>Default</b>     | n/a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |               |                                                                                                                                                                                                                     |
| <b>Parameters</b>  | <i>red-diff-delay</i> — the maximum red differential delay value, in milliseconds<br><br><table> <tr> <td><b>Values</b></td><td>0 to 25 ms for MLPPP bundles<br/>2 to 75 ms for IMA bundles on the 16-port T1/E1 ASAP Adapter card and 32-port T1/E1 ASAP Adapter card<br/>2 to 75 ms for IMA bundles on the 2-port OC3/STM1 Channelized Adapter card</td></tr> </table> <p><b>down</b> — transition the circuit that exceeded the differential delay to a down state (for example, remove it from the multilink bundle from an operational perspective). To transition the circuit back to the up state, the user should shutdown, then no shutdown the channel group.</p> | <b>Values</b> | 0 to 25 ms for MLPPP bundles<br>2 to 75 ms for IMA bundles on the 16-port T1/E1 ASAP Adapter card and 32-port T1/E1 ASAP Adapter card<br>2 to 75 ms for IMA bundles on the 2-port OC3/STM1 Channelized Adapter card |
| <b>Values</b>      | 0 to 25 ms for MLPPP bundles<br>2 to 75 ms for IMA bundles on the 16-port T1/E1 ASAP Adapter card and 32-port T1/E1 ASAP Adapter card<br>2 to 75 ms for IMA bundles on the 2-port OC3/STM1 Channelized Adapter card                                                                                                                                                                                                                                                                                                                                                                                                                                                         |               |                                                                                                                                                                                                                     |

## short-sequence

|                    |                                                                                                                                                                                                                                                                     |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | [ <b>no</b> ] <b>short-sequence</b>                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>port>multilink-bundle                                                                                                                                                                                                                                        |
| <b>Description</b> | This command specifies that the MLPPP bundle should use short (12 bit) sequence numbers instead of the default 24-bit sequence number. This command is only valid for MLPPP bundles.<br><br>The <b>no</b> form of this command disables the short-sequence feature. |
| <b>Default</b>     | no short-sequence                                                                                                                                                                                                                                                   |

## yellow-differential-delay

|                |                                                                                                  |
|----------------|--------------------------------------------------------------------------------------------------|
| <b>Syntax</b>  | <b>yellow-differential-delay</b> <i>yellow-diff-delay</i><br><b>no yellow-differential-delay</b> |
| <b>Context</b> | config>port>multilink-bundle                                                                     |

**Description** This command sets the yellow warning threshold for the differential delay for members within a multilink bundle. If circuit's delay exceeds the yellow-differential delay value, a log message and SNMP trap is sent. This command is only valid for MLPPP bundles.

The **no** form of this command removes the yellow-differential-delay.

**Default** n/a

**Parameters** *yellow-diff-delay* — the maximum yellow differential delay threshold value, in milliseconds

**Values** 1 to 25

## ima

**Syntax** ima

**Context** config>port>multilink-bundle

**Description** This command enables the context to configure parameters for an IMA group. An IMA group is a collection of physical links bundled together and assigned to an ATM port. IMA enables a high-speed channel that is composed of ATM cells to be transported as a number of lower-speed circuits. They are then reassembled as the original high-speed ATM channel.

This command is only valid for IMA bundles.

## link-delay

**Syntax** link-delay {**activate** | **deactivate**} *milliseconds*  
no link-delay {**activate** | **deactivate**}

**Context** config>port>multilink-bundle>ima

**Description** This command specifies the time delay between detection of a link activation/deactivation condition and acting upon it (going in/out of the Rx failure state on a link).

**Parameters** **activate** *milliseconds* — the time, in milliseconds, used to clear an existing LIF, LODS, or FRI-IMA alarm. The time specified determines how long is needed for member links to stabilize before being activated.

**Values** 1 to 30000 ms

**Default** 1000

**deactivate** *milliseconds* — the time, in milliseconds, used to raise an LIF, LODS, or FRI-IMA alarm. The time specified determines how long before a member link is declared in error and is deactivated.

**Values** 1 to 30000 ms

**Default** 2000

---

## test-pattern-procedure

|                    |                                                                                                                                                                         |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>test-pattern-procedure</b>                                                                                                                                           |
| <b>Context</b>     | config>port>multilink-bundle>ima                                                                                                                                        |
| <b>Description</b> | This command enables the context to configure IMA test pattern procedures. This command and its sub-commands are not saved in the router configuration between reboots. |

## test-link

|                    |                                                                                                                                                                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>test-link</b> <i>port-id</i><br><b>no test-link</b>                                                                                                                                                                                               |
| <b>Context</b>     | config>port>multilink-bundle>ima>test-pattern-procedure                                                                                                                                                                                              |
| <b>Description</b> | <p>This command specifies IMA members on which an IMA test pattern procedure is to be performed.</p> <p>The <b>no</b> form of this command deletes the link from the test-pattern procedure. The test-pattern procedure must be shut down first.</p> |
| <b>Default</b>     | no test-link                                                                                                                                                                                                                                         |
| <b>Parameters</b>  | <i>port-id</i> — the port ID to be used to verify link connectivity within an IMA group                                                                                                                                                              |

## test-pattern

|                    |                                                                                                                                                                                                                                                                                      |               |          |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------|
| <b>Syntax</b>      | <b>test-pattern</b> <i>pattern</i><br><b>no test-pattern</b>                                                                                                                                                                                                                         |               |          |
| <b>Context</b>     | config>port>multilink-bundle>ima>test-pattern-procedure                                                                                                                                                                                                                              |               |          |
| <b>Description</b> | <p>This command specifies the transmit test pattern in an IMA group loopback operation. This value can only be changed when the <a href="#">test-pattern-procedure</a> command is shut down.</p> <p>The <b>no</b> form of this command restores the test pattern to the default.</p> |               |          |
| <b>Default</b>     | 0                                                                                                                                                                                                                                                                                    |               |          |
| <b>Parameters</b>  | <i>pattern</i> — specifies an integer taking the following values:<br><table><tr><td><b>Values</b></td><td>0 to 255</td></tr></table>                                                                                                                                                | <b>Values</b> | 0 to 255 |
| <b>Values</b>      | 0 to 255                                                                                                                                                                                                                                                                             |               |          |

---

shutdown

|                    |                                                                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] shutdown</b>                                                                                                                                    |
| <b>Context</b>     | config>port>multilink-bundle>ima>test-pattern-procedure                                                                                                 |
| <b>Description</b> | <p>This command enables a configured IMA test pattern procedure.</p> <p>The <b>no</b> form of this command disables the IMA test pattern procedure.</p> |

version

|                    |                                                                                                                                                                                                                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>version</b> <i>IMA-version</i><br><b>no version</b>                                                                                                                                                                                                                                                                                |
| <b>Context</b>     | config>port>multilink-bundle>ima>                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | <p>This command configures the IMA version for the multilink bundle group. If there is a version mismatch between this IMA group and the far-end IMA group, the IMA group will go operationally down. To change the IMA version, you must first remove all member links from the group.</p> <p>Only IMA version 1.1 is supported.</p> |
| <b>Default</b>     | 1-1                                                                                                                                                                                                                                                                                                                                   |
| <b>Parameters</b>  | <i>IMA-version</i> — specifies the IMA version for this group                                                                                                                                                                                                                                                                         |
|                    | <b>Values</b> 1-1 — IMA version 1.1                                                                                                                                                                                                                                                                                                   |



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### 3.13.2.22 ATM Interface Commands

#### atm

|                    |                                                                                                                                                                                      |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>atm</b>                                                                                                                                                                           |
| <b>Context</b>     | config>port>multilink-bundle>ima<br>config>port>tdm>ds1>channel-group<br>config>port>tdm>e1>channel-group<br>config>port>tdm>ds3<br>config>port>tdm>e3<br>config>port>sonet-sdh>path |
| <b>Description</b> | This command enables the context to configure ATM interface properties.                                                                                                              |

#### cell-format

|                    |                                                                                                                                                                                                                                |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>cell-format</b> <i>cell-format</i><br><b>no cell-format</b>                                                                                                                                                                 |
| <b>Context</b>     | config>port>multilink-bundle>ima>atm<br>config>port>tdm>ds1>channel-group>atm<br>config>port>tdm>e1>channel-group>atm<br>config>port>tdm>ds3>atm<br>config>port>tdm>e3>atm<br>config>port>sonet-sdh>path>atm                   |
| <b>Description</b> | This command configures the ATM cell format.<br><br>The <b>no</b> form of this command restores the default value.                                                                                                             |
| <b>Default</b>     | uni                                                                                                                                                                                                                            |
| <b>Parameters</b>  | <i>cell-format</i> — the ATM cell format, either UNI or NNI (SONET/SDH ports do not support the NNI format)<br><br><b>Values</b> uni (user-to-network interface cell format)<br>nni (network-to-network interface cell format) |

mapping

|                    |                                                                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mapping direct</b><br><b>no mapping</b>                                                                                                              |
| <b>Context</b>     | config>port>tdm>ds3>atm                                                                                                                                 |
| <b>Description</b> | This command specifies the ATM cell mapping to be used on this DS3 ATM interface.<br><br>The <b>no</b> form of this command restores the default value. |



**Note:** For an E3 interface, the **mapping** command does not appear in the CLI; the interface is hard-coded for direct mapping.

|                   |                                               |
|-------------------|-----------------------------------------------|
| <b>Default</b>    | direct                                        |
| <b>Parameters</b> | <b>direct</b> — specifies direct cell mapping |

min-vp-vpi

|                    |                                                                                                                                                                                                                              |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>min-vp-vpi</b> <i>value</i><br><b>no min-vp-vpi</b>                                                                                                                                                                       |
| <b>Context</b>     | config>port>multilink-bundle>ima>atm<br>config>port>tdm>ds1>channel-group>atm<br>config>port>tdm>e1>channel-group>atm<br>config>port>tdm>ds3>atm<br>config>port>tdm>e3>atm<br>config>port>sonet-sdh>path>atm                 |
| <b>Description</b> | This command sets the minimum allowable virtual path identifier (VPI) value that can be used on the ATM interface for a virtual path connection (VPC).<br><br>The <b>no</b> form of this command restores the default value. |
| <b>Default</b>     | 0                                                                                                                                                                                                                            |
| <b>Parameters</b>  | <i>value</i> — the minimum allowable VPI value that can be used on the ATM interface for a VPC<br><br><b>Values</b> 0 to 4095 (NNI) (not supported on SDH/SONET ports)<br>0 to 255 (UNI)                                     |

### 3.13.2.23 TDM Commands

#### tdm

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>tdm</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Context</b>     | config>port                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | <p>This command enables the context to configure:</p> <ul style="list-style-type: none"> <li>• DS1/E1 parameters for a port on a channelized 16-port T1/E1 ASAP Adapter card, 32-port T1/E1 ASAP Adapter card, 2-port OC3/STM1 Channelized Adapter card, 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card, or 4-port DS3/E3 Adapter card (DS3 ports only)</li> <li>• DS3 parameters for a port on a channelized 2-port OC3/STM1 Channelized Adapter card</li> <li>• DS3/E3 parameters for a port on a 4-port DS3/E3 Adapter card</li> <li>• codirectional and teleprotection interfaces (TPIF) parameters for a port on an 8-port Voice &amp; Teleprotection card</li> </ul> <p>TDM is a mechanism that divides the bandwidth of a stream into separate channels or timeslots by assigning each stream a different timeslot in a set. TDM repeatedly transmits a fixed sequence of timeslots over a single transmission channel. Each individual data stream is reassembled at the receiving end based on the timing.</p> |
| <b>Default</b>     | n/a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

#### buildout

|                    |                                                                                                                                                                                                                                                                                                                                      |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>buildout {long   short}</b>                                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | config>port>tdm                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b> | This command specifies the line buildout (cable length) for physical DS1 ports on the 16-port T1/E1 ASAP Adapter card and 32-port T1/E1 ASAP Adapter card, or for physical DS3/E3 ports on the 4-port DS3/E3 Adapter card.                                                                                                           |
| <b>Default</b>     | short (this is the only option available for the 16-port T1/E1 ASAP Adapter card and 32-port T1/E1 ASAP Adapter card)                                                                                                                                                                                                                |
| <b>Parameters</b>  | <p><b>long</b> — sets the line buildout for length runs up to 450 ft (for the 4-port DS3/E3 Adapter card only)</p> <p><b>short</b> — sets the line buildout for length runs up to 225 ft (for the 4-port DS3/E3 Adapter card only) or up to 655 ft (for the 16-port T1/E1 ASAP Adapter card and 32-port T1/E1 ASAP Adapter card)</p> |

## codir

|                    |                                                                                                                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] codir</b>                                                                                                                                                                                   |
| <b>Context</b>     | config>port>tdm                                                                                                                                                                                     |
| <b>Description</b> | This command creates a 64 kb/s codirectional G.703 channel on a port on the 8-port Voice & Teleprotection card.<br><br>The <b>no</b> form of this command deletes the port's codirectional channel. |
| <b>Default</b>     | n/a                                                                                                                                                                                                 |

## channel-group

|                    |                                                                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] channel-group</b> <i>channel-group-id</i>                                                                                                                                                        |
| <b>Context</b>     | config>port>tdm>codir<br>config>port>tdm>tpif                                                                                                                                                            |
| <b>Description</b> | This command creates a DS0 channel group on a TDM interface on the 8-port Voice & Teleprotection card.<br><br>The <b>no</b> form of this command deletes the port's codirectional or TPIF channel group. |
| <b>Default</b>     | n/a                                                                                                                                                                                                      |
| <b>Parameters</b>  | <i>channel-group-id</i> — specifies the channel group ID number                                                                                                                                          |
| <b>Values</b>      | 1                                                                                                                                                                                                        |

## encap-type

|                    |                                                                                                                          |
|--------------------|--------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>encap-type cem</b>                                                                                                    |
| <b>Context</b>     | config>port>tdm>codir>channel-group<br>config>port>tdm>tpif>channel-group                                                |
| <b>Description</b> | This command specifies the encapsulation type. The channel group must be deleted before changing the encapsulation type. |
| <b>Default</b>     | no encap-type                                                                                                            |
| <b>Parameters</b>  | <b>cem</b> — circuit emulation (TDM)                                                                                     |

## mode

|                    |                                                                                                                                                                                                                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mode access</b>                                                                                                                                                                                                                                                                                             |
| <b>Context</b>     | config>port>tdm>codir>channel-group<br>config>port>tdm>tpif>channel-group                                                                                                                                                                                                                                      |
| <b>Description</b> | This command configures the interface for access mode. An access port or channel is used for customer-facing traffic. A Service Access Point (SAP) can only be configured on an access port or channel. When an interface is configured for access mode, the appropriate encapsulation type must be specified. |
| <b>Default</b>     | access                                                                                                                                                                                                                                                                                                         |
| <b>Parameters</b>  | <b>access</b> — configures the port as service access                                                                                                                                                                                                                                                          |

## loopback

|                    |                                                                                                                                                                                                                                                                                                                            |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>loopback {internal   line}</b><br><b>no loopback</b>                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | config>port>tdm>codir<br>config>port>tdm>tpif                                                                                                                                                                                                                                                                              |
| <b>Description</b> | This command puts the specified interface into a loopback mode. The port must be shut down before loopback mode is enabled.<br><br>This command is not saved in the system configuration between boots.<br><br>The <b>no</b> form of this command disables the loopback on the interface.                                  |
| <b>Default</b>     | no loopback                                                                                                                                                                                                                                                                                                                |
| <b>Parameters</b>  | <b>internal</b> — places the port or channel into an internal loopback mode. An internal loopback loops the frames from the local router back to the framer.<br><br><b>line</b> — places the port or channel into a line loopback mode. A line loopback loops data received on the port or channel back to the remote end. |

## report-alarm

|                    |                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>report-alarm {ais   los   rai}</b><br><b>no report-alarm</b>                                       |
| <b>Context</b>     | config>port>tdm>codir<br>config>port>tdm>tpif                                                         |
| <b>Description</b> | This command enables logging of codirectional and TPIF alarms for the specified interface or channel. |

The **no** form of this command disables logging of the specified alarm.

**Default**      ais for codir

rai for tpif

**Parameters**    **ais** — reports alarm indication signal errors (configurable for codir only)  
**los** — reports loss of signal errors  
**rai** — reports remote alarm indication signal errors (configurable for tpif only)

## timing-8k

**Syntax**        [no] **timing-8k**

**Context**        config>port>tdm>codir

**Description**    This command enables generation of an 8-kHz signal on a codirectional interface.

**Default**        disabled

## ds1

**Syntax**        [no] **ds1** *ds1-id*

**Context**        config>port>tdm

**Description**    This command enables the context to configure DS1 frame parameters on a channelized 16-port T1/E1 ASAP Adapter card, 32-port T1/E1 ASAP Adapter card, 2-port OC3/STM1 Channelized Adapter card, 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card, or 4-port DS3/E3 Adapter card (DS3 ports only).

T1 transmits DS1-formatted data at 1.544 Mb/s through the network.

Once a channel has been configured for DS1, all ports on the card can only be configured for DS1. There cannot be a mix of DS1 and E1 channels on the same card.

The **no** form of this command deletes the specified DS1 channel.

**Default**        n/a

**Parameters**    *ds1-id* — the identifier of the DS1 channel

**Values**        DS1 number (1 to 28) | *ds1-sonet-sdh-index*

## ds3

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] ds3</b> [ <i>sonet-sdh-index</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | config>port>tdm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | <p>This command enables the context to configure DS3 parameters on a 2-port OC3/STM1 Channelized Adapter card or a 4-port DS3/E3 Adapter card.</p> <p>DS3 lines carry 28 DS1 signals and a 44.736 Mb/s data rate.</p> <p>If DS3 links are provisioned on a channelized SONET/SDH Adapter card, you must provision the parent STS-1 SONET/STM0 SDH path first (this requirement does not apply to the 4-port DS3/E3 Adapter card).</p> <p>The <b>no</b> form of this command disables DS3 capabilities on the specified SONET/SDH path or DS3 port. The DS3 parameters must be disabled if a clear channel is enabled by default. A clear channel uses out-of-band signaling, not in-band signaling; therefore, the entire bit rate of the channel is available.</p> |
| <b>Default</b>     | n/a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Parameters</b>  | <i>sonet-sdh-index</i> — specifies the components making up the specified SONET/SDH path on the 2-port OC3/STM1 Channelized Adapter card                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

## e1

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] e1</b> <i>e1-id</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Context</b>     | config>port>tdm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b> | <p>This command enables the context to configure E1 parameters on a channelized 16-port T1/E1 ASAP Adapter card, 32-port T1/E1 ASAP Adapter card, 2-port OC3/STM1 Channelized Adapter card, 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card, or 4-port DS3/E3 Adapter card (DS3 ports only). E1 is a standard WAN digital communication format designed to operate over copper facilities at a rate of 2.048 Mb/s.</p> <p>Once a channel has been configured for E1, all ports on the card can only be configured for E1. There cannot be a mix of DS1 and E1 channels on the same card.</p> <p>The <b>no</b> form of this command deletes the specified E1 channel.</p> |
| <b>Default</b>     | n/a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Parameters</b>  | <i>e1-id</i> — the identifier of the E1 channel                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Values</b>      | E1 number (1 to 21)   <i>e1-sonet-sdh-index</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

## e3

|                    |                                                                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] e3</b> [ <i>sonet-sdh-index</i> ]                                                                                                                                                                |
| <b>Context</b>     | config>port>tdm                                                                                                                                                                                          |
| <b>Description</b> | This command enables the context to configure E3 parameters on a 4-port DS3/E3 Adapter card. E3 lines provide a speed of 34.368 Mb/s and are frequently used by service providers outside North America. |
| <b>Default</b>     | n/a                                                                                                                                                                                                      |
| <b>Parameters</b>  | <i>sonet-sdh-index</i> — specifies the components making up the specified SONET/SDH path on the 2-port OC3/STM1 Channelized Adapter card                                                                 |

## encoding

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>encoding</b> { <b>b8zs</b>   <b>ami</b> }                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>port>tdm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | <p>This command configures the encoding for the physical DS1 (T1) port. DS1 ports can be configured for either B8ZS (bipolar with eight-zero substitution) zero code suppression or AMI (alternate mark inversion). B8ZS and AMI are line coding techniques.</p> <p>This command is supported on the following cards and platforms:</p> <ul style="list-style-type: none"> <li>• 16-port T1/E1 ASAP Adapter card, version 2</li> <li>• 32-port T1/E1 ASAP Adapter card</li> <li>• 7705 SAR-A (on the variant with T1 ports)</li> <li>• 7705 SAR-M (on the variants with T1 ports)</li> </ul> |
| <b>Default</b>     | b8zs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

## length

|                    |                                                                                                                                                                                                                                                                                                                                          |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>length</b> { <b>133</b>   <b>266</b>   <b>399</b>   <b>533</b>   <b>655</b> }                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>port>tdm                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b> | <p>This command configures the line length for the physical DS1 port on the 16-port T1/E1 ASAP Adapter card or 32-port T1/E1 ASAP Adapter card.</p> <p>Line buildout settings must be adjusted with line length in order to ensure nominal operating voltage levels for receivers. Ideal receiver voltage levels should be &lt; 3Vp.</p> |
| <b>Default</b>     | 133                                                                                                                                                                                                                                                                                                                                      |



## line-impedance

|                    |                                                                                                                                                                                                                                 |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>line-impedance</b> { <b>75</b>   <b>100</b>   <b>120</b> }                                                                                                                                                                   |
| <b>Context</b>     | config>port>tdm                                                                                                                                                                                                                 |
| <b>Description</b> | This command configures the line impedance of a port. Line impedance is set on a per-port basis and ports on the same card can have different values. Before changing the line impedance of a port, the port must be shut down. |
| <b>Default</b>     | 100 for DS1<br>120 for E1                                                                                                                                                                                                       |
| <b>Parameters</b>  | <b>75</b> — 75 $\Omega$<br><b>100</b> — 100 $\Omega$<br><b>120</b> — 120 $\Omega$                                                                                                                                               |

## tpif

|                    |                                                                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] tpiif</b>                                                                                                                                       |
| <b>Context</b>     | config>port>tdm                                                                                                                                         |
| <b>Description</b> | This command creates an IEEE C37.94 teleprotection interface (TPIF) channel.<br><br>The <b>no</b> form of this command deletes the port's TPIF channel. |
| <b>Default</b>     | n/a                                                                                                                                                     |

## timeslots

|                    |                                                                                                                                                                                                                                                                                |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>timeslots</b> <i>timeslots</i>                                                                                                                                                                                                                                              |
| <b>Context</b>     | config>port>tdm>tpif>channel-group                                                                                                                                                                                                                                             |
| <b>Description</b> | This command defines the list of DS0 timeslots to be used in the TPIF channel group.                                                                                                                                                                                           |
| <b>Default</b>     | 1                                                                                                                                                                                                                                                                              |
| <b>Parameters</b>  | <i>timeslots</i> — specifies the number of consecutive timeslots to be associated with the channel group. The value must start from the first timeslot. It represents line bandwidth of $n \times 64$ kb/s, where $n$ is the number of timeslots.<br><br><b>Values</b> 1 to 12 |

### 3.13.2.24 DS1 and E1 Commands

#### channelized

|                    |                                                                                                                                                                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>channelized {ds1   e1}</b><br><b>no channelized</b>                                                                                                                                                                                                |
| <b>Context</b>     | config>port>tdm>ds3                                                                                                                                                                                                                                   |
| <b>Description</b> | This command configures the associated DS3 channel as a channelized DS3 with DS1/E1 sub-channels.<br><br>The <b>no</b> form of this command disables channelization. The sub-channels must be deleted first before the <b>no</b> command is executed. |
| <b>Default</b>     | no channelized                                                                                                                                                                                                                                        |
| <b>Parameters</b>  | <b>ds1</b> — specifies that the channel is DS1<br><b>e1</b> — specifies that the channel is E1                                                                                                                                                        |

#### clock-source

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>clock-source {loop-timed   node-timed   adaptive   differential}</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | config>port>tdm>ds1<br>config>port>tdm>e1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b> | This command specifies the clock source to be used for the link transmit timing.<br><br>The following can be configured for loop timing and node timing: <ul style="list-style-type: none"> <li>• T1/E1 CES circuits on the 16-port T1/E1 ASAP Adapter card</li> <li>• T1/E1 CES circuits on the 32-port T1/E1 ASAP Adapter card</li> <li>• T1/E1 CES circuits on the 2-port OC3/STM1 Channelized Adapter card</li> <li>• T1/E1 CES circuits on the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card</li> <li>• T1/E1 CES circuits on the 4-port DS3/E3 Adapter card</li> </ul> |

The following can be configured for adaptive timing:

- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- T1/E1 ports on the 7705 SAR-M (variants with T1/E1 ports) on T1/E1 CES circuits used for TDM pseudowires
- T1/E1 ports on the 7705 SAR-X on T1/E1 CES circuits used for TDM pseudowires
- T1/E1 ports on the 7705 SAR-A (variant with T1/E1 ports) on T1/E1 CES circuits used for TDM pseudowires
- T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module

The following can be configured for differential timing:

- 16-port T1/E1 ASAP Adapter card, version 2
- 32-port T1/E1 ASAP Adapter card
- T1/E1 channels on the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card
- T1/E1 channels on the DS3 ports on the 4-port DS3/E3 Adapter card (E3 ports cannot be channelized)
- T1/E1 ports on the 7705 SAR-M (variants with T1/E1 ports)
- T1/E1 ports on the 7705 SAR-X
- T1/E1 ports on the 7705 SAR-A (variants with T1/E1 ports)
- T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module

The clock source setting also determines the node sync reference if the port is configured as one of the node sync references (**config>system>sync-if-timing>{ref1 | ref2}> source-port** command). Refer to the 7705 SAR Basic System Configuration Guide, “Node Timing”, for more information.



**Note:** If a timing reference from an external BITS clock is used on a dedicated T1/E1 port, the port must be configured as loop-timed.

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | node-timed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Parameters</b> | <p><b>loop-timed</b> — the link recovers the clock from the received data stream</p> <p><b>node-timed</b> — the link uses the internal clock when transmitting data</p> <p><b>adaptive</b> — clocking is derived from the incoming pseudowire packets from the MPLS network</p> <p><b>differential</b> — clocking is derived from a common clock compared to differential clock recovery (DCR) data in the RTP header in the TDM PW overhead. DCR must also be enabled on the relevant card, module, or chassis with the <a href="#">clock-mode</a> command.</p> |

## framing (DS1)

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>framing {esf   sf   ds1-unframed}</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | config>port>tdm>ds1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | <p>This command specifies the DS1 framing to be used for the port.</p> <p>The <b>ds1-unframed</b> parameter allows the configuration of an unstructured DS1 channel on the following:</p> <ul style="list-style-type: none"> <li>• 16-port T1/E1 ASAP Adapter card</li> <li>• 32-port T1/E1 ASAP Adapter card</li> <li>• 2-port OC3/STM1 Channelized Adapter card</li> <li>• 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card</li> <li>• 4-port DS3/E3 Adapter card (DS3 ports only)</li> <li>• 4-port T1/E1 and RS-232 Combination module (T1/E1 ports only)</li> </ul> <p>When an unframed DS1 channel is shut down, it sends the AIS pattern to the far-end DS1. The far end does not react to the AIS pattern if the far-end DS1 is configured as unframed. If the far-end DS1 is configured as framed, the far end declares AIS. The operational status remains up and no alarms are generated while the near end is operationally down. This is normal behavior for unframed G.703 mode.</p> |
| <b>Default</b>     | esf                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Parameters</b>  | <p><b>esf</b> — configures the DS1 port for extended superframe framing</p> <p><b>sf</b> — configures the DS1 port for superframe framing</p> <p><b>ds1-unframed</b> — specifies DS1 unframed (G.703) mode for DS1 interfaces. DS1 unframed mode is only applicable if the encapsulation type is set to cem or ppp-auto.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

## framing (E1)

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>framing {no-crc-g704   g704   e1-unframed}</b>                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | config>port>tdm>e1                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b> | <p>This command specifies the E1 framing to be used for the port.</p> <p>The <b>e1-unframed</b> parameter allows the configuration of an unstructured E1 channel on the following:</p> <ul style="list-style-type: none"> <li>• 16-port T1/E1 ASAP Adapter card</li> <li>• 32-port T1/E1 ASAP Adapter card</li> <li>• 2-port OC3/STM1 Channelized Adapter card</li> <li>• 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card</li> </ul> |

- 4-port DS3/E3 Adapter card (DS3 ports only)
- 4-port T1/E1 and RS-232 Combination module (T1/E1 ports only)

When an unframed E1 channel is shut down, it sends the AIS pattern to the far-end E1. The far end does not react to the AIS pattern if the far-end E1 is configured as unframed. If the far-end E1 is configured as framed, the far end declares AIS. The operational status remains up and no alarms are generated while the near end is operationally down. This is normal behavior for unframed G.703 mode.

|                   |                                                                                                                                                                                                                                                                                                                |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | g704                                                                                                                                                                                                                                                                                                           |
| <b>Parameters</b> | <p><b>g704</b> — configures the E1 port for G.704 framing</p> <p><b>no-crc-g704</b> — configures the E1 port for G.704 framing with no CRC4</p> <p><b>e1-unframed</b> — specifies E1 unframed (G.703) mode for E1 interfaces. E1 unframed mode is only applicable if the encapsulation type is set to cem.</p> |

## hold-time

|                    |                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>hold-time</b> {[ <b>up</b> <i>hold-time-up</i> ] [ <b>down</b> <i>hold-time-down</i> ]}<br><b>no hold-time</b>                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | config>port>tdm>ds1<br>config>port>tdm>e1                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | This command configures the DS1/E1 link dampening timers in 100s of milliseconds, which guards against reporting excessive interface transitions. Once implemented, subsequent transitions of the interface from one state to another are not advertised to upper layer protocols until the configured timer has expired.                                                                            |
| <b>Default</b>     | no hold-time                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Parameters</b>  | <p><i>hold-time-up</i> — the hold-timer for link-up event dampening. A value of zero (0) indicates that an up transition is reported immediately.</p> <p><b>Values</b> 0 to 100 (in 100 ms)</p> <p><i>hold-time-down</i> — the hold-timer for link-down event dampening. A value of zero (0) indicates that a down transition is reported immediately.</p> <p><b>Values</b> 0 to 100 (in 100 ms)</p> |

loopback (DS1)

|                    |                                                                                                  |
|--------------------|--------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>loopback {line   internal   fdl-ansi   fdl-bellcore   payload-ansi}</b><br><b>no loopback</b> |
| <b>Context</b>     | config>port>tdm>ds1                                                                              |
| <b>Description</b> | This command puts the specified port or channel in a loopback mode.                              |

A **line** loopback loops frames received on the corresponding port or channel back towards the transmit (egress) direction before reaching the framer. The bit stream is not reframed. The electrical signal is regenerated by the Tx line interface unit (LIU) and the timing is provided by the Rx LIU.

An **internal** loopback loops the frames that are coming in an egress direction from the fabric towards the framer, back to the fabric. This is usually referred to as an equipment loopback. The Tx signal is looped back and received by the interface.

The **fdl-ansi** loopback command sends a repeating 16-bit ESF data link code word to the remote end requesting that it enter into a network line loopback. The **ansi** keyword enables the remote line FDL ANSI bit loopback on the T1 line, in accordance with the ANSI T1.403 specification.

The **fdl-bellcore** loopback command sends a repeating 16-bit ESF data link code word to the remote end requesting that it enter into a network line loopback. The **bellcore** keyword enables the remote line FDL Bellcore bit loopback on the T1 line, in accordance with the Bellcore TR-TSY-000312 specification.

The **payload-ansi** loopback command sends a repeating 16-bit ESF data link code word to the remote end requesting that it enter into a network payload loopback. A payload loopback loops frames back towards the transmit (egress) direction after reaching the framer. The bit stream is reframed. The electrical signal is regenerated by the Tx LIU and the timing is provided by the Rx LIU.

The loopback command is not saved to the system configuration.

The **no** form of this command disables the specified type of loopback.



**Note:**

- The **fdl-ansi**, **fdl-bellcore** and **payload-ansi** options can only be configured if DS1 framing is set to ESF.
- The 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card cannot initiate **fdl-ansi**, **fdl-bellcore**, or **payload-ansi** loopbacks.
- The 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card supports up to 16 line loopbacks and 16 internal loopbacks at a time.

|                |             |
|----------------|-------------|
| <b>Default</b> | no loopback |
|----------------|-------------|

---

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Parameters</b> | <b>line</b> — places the associated port or channel into line loopback mode<br><b>internal</b> — places the associated port or channel into internal loopback mode<br><b>fdl-ansi</b> — requests an FDL line loopback in accordance with the ANSI T1.403 specification<br><b>fdl-bellcore</b> — requests an FDL line loopback in accordance with the Bellcore TR-TSY-000312 specification<br><b>payload-ansi</b> — requests a payload loopback using ANSI signaling |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## loopback (E1)

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>loopback {line   internal}</b><br><b>no loopback</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | config>port>tdm>e1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Description</b> | <p>This command puts the specified port or channel in a loopback mode.</p> <p>A line loopback loops frames received on the corresponding port or channel back towards the transmit (egress) direction before reaching the framer. The bit stream is not reframed. The electrical signal is regenerated by the Tx line interface unit (LIU) and the timing is provided by the Rx LIU.</p> <p>An internal loopback loops the frames that are coming in an egress direction from the fabric towards the framer, back to the fabric. This is usually referred to as an equipment loopback. The Tx signal is looped back and received by the interface. The loopback command is not saved to the system configuration.</p> <p>The <b>no</b> form of this command disables the specified type of loopback.</p> |
| <b>Default</b>     | no loopback                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Parameters</b>  | <b>line</b> — places the associated port or channel into line loopback mode<br><b>internal</b> — places the associated port or channel into internal loopback mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

## remote-loop-respond

|                    |                                                                                                                                                                            |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] remote-loop-respond</b>                                                                                                                                            |
| <b>Context</b>     | config>port>tdm>ds1                                                                                                                                                        |
| <b>Description</b> | This command configures the DS1 channel response to remote loopbacks. When enabled, the channel responds to remote loopbacks; when disabled, the channel does not respond. |



**Note:** The 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card cannot respond to **fdl-ansi**, **fdl-bellcore**, or **payload-ansi** loopbacks.

**Default** no remote-loop-respond

## report-alarm

**Syntax** [no] **report-alarm** {**ais** | **los** | **oof** | **rai** | **looped** | **ber-sd** | **ber-sf**}

**Context** config>port>tdm>ds1  
config>port>tdm>e1

**Description** This command enables logging of DS1 or E1 alarms. When configured, logging is enabled for the raising and clearing of the specified alarms.

The **no** form of this command disables logging of the specified alarms.

**Parameters** **ais** — reports alarm indication signal errors

**Default** ais alarms are issued

**los** — reports loss of signal errors

**Default** los alarms are issued

**oof** — reports out-of-frame errors

**Default** oof alarms are not issued

**rai** — reports remote alarm indication signal errors

**Default** rai alarms are not issued

**looped** — reports looped packets errors

**Default** looped alarms are not issued

**ber-sd** — reports BER line signal degradation errors on:

- the 16-port T1/E1 ASAP Adapter card
- the 32-port T1/E1 ASAP Adapter card
- T1/E1 ports on the 7705 SAR-M
- T1/E1 ports on the 7705 SAR-X
- T1/E1 ports on the 7705 SAR-A
- T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module

**Default** line signal degradation alarms are not issued

**ber-sf** — reports BER line signal failure errors on:

- the 16-port T1/E1 ASAP Adapter card
- the 32-port T1/E1 ASAP Adapter card



- T1/E1 ports on the 7705 SAR-M
- T1/E1 ports on the 7705 SAR-X
- T1/E1 ports on the 7705 SAR-A
- T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module

**Default** line signal failure alarms are not issued

## signal-mode

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] signal-mode cas</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | config>port>tdm>ds1<br>config>port>tdm>e1<br>config>port>tdm>ds1>channel-group<br>config>port>tdm>e1>channel-group                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b> | <p>This command enables or disables Channel Associated Signaling (CAS) at the port and circuit levels. When enabled, control signals (such as those for synchronizing and bounding frames) are carried in the same channels as voice and data signals.</p> <p>If the signal mode for a DS1 or an E1 port is configured for <b>no signal-mode</b>, then all DS0/64 kb/s channels within the DS1 or E1 port will not be enabled for CAS. Individual channel groups within that DS1 or E1 port inherit this state and cannot be changed.</p> <p>If the signal mode for a DS1 or an E1 port is configured for <b>signal-mode cas</b>, then any new channel groups default to <b>signal-mode cas</b> and any existing channel groups can be individually changed from <b>cas</b> to <b>no signal-mode</b>.</p> <p>The signal mode must be configured for CAS before creating a Cpipe service that supports T1 or E1 with CAS. Refer to the 7705 SAR Services Guide, "Creating a Cpipe Service", for information on configuring a Cpipe service.</p> <p>This command is valid only on the 16-port T1/E1 ASAP Adapter card, 32-port T1/E1 ASAP Adapter card, 2-port OC3/STM1 Channelized Adapter card, 4-port DS3/E3 Adapter card, or 4-port T1/E1 and RS-232 Combination module when DS1 framing is set to <b>esf</b> or <b>sf</b>, or E1 framing is set to <b>g704</b> or <b>no-crc-g704</b>.</p> |
| <b>Parameters</b>  | <b>cas</b> — specifies channel associated signaling                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

## ssm

|                    |                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>ssm</b>                                                                                           |
| <b>Context</b>     | config>port>tdm>e1                                                                                   |
| <b>Description</b> | This command accesses the context to configure E1 Synchronization Status Messaging (SSM) parameters. |



**Note:** Only **g704** framing mode should be used with E1 SSM. The **no-crc-g704** and **e1-unframed** framing modes are not compatible with E1 SSM. See the [framing \(E1\)](#) command for information on E1 framing.

ssm-bit

|                    |                                                                                                              |
|--------------------|--------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>ssm-bit</b> <i>sa-bit</i><br><b>no ssm-bit</b>                                                            |
| <b>Context</b>     | config>port>tdm>e1>ssm                                                                                       |
| <b>Description</b> | This command configures which Sa bit in the E1 frame to use for conveying the quality level SSM information. |
| <b>Default</b>     | 8                                                                                                            |
| <b>Parameters</b>  | <i>sa-bit</i> — identifies which Sa bit to use for SSM information<br><b>Values</b> 4 to 8                   |

tx-dus

|                    |                                                                                                                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] tx-dus</b>                                                                                                                                                                                                                 |
| <b>Context</b>     | config>port>tdm>e1>ssm                                                                                                                                                                                                             |
| <b>Description</b> | This command enables or disables the transmission of 0xF (DUS) (do not use for synchronization) in the SSM channel. The code 0xF is transmitted but it is translated to DNU (do not use) for E1 or SDH and to DUS for SONET or T1. |
| <b>Default</b>     | no tx-dus                                                                                                                                                                                                                          |

threshold

|                    |                                                                                                                                                                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>threshold {ber-sd   ber-sf} rate</b> <i>threshold-rate</i><br><b>no threshold {ber-sd   ber-sf}</b>                                                                                                                                                |
| <b>Context</b>     | config>port>tdm>ds1<br>config>port>tdm>e1                                                                                                                                                                                                             |
| <b>Description</b> | <p>This command configures the line signal degradation (SD) bit error rate (BER) and line signal failure (SF) thresholds.</p> <p>PCV error rates are measured and when they cross either the degradation or failure threshold, alarms are raised.</p> |

---

The **no** form of this command disables the BER-SD or BER-SF feature.

**Default**    ber-sd - disabled  
              ber-sf - disabled

**Parameters**    **threshold ber-sd** — specifies the BER that specifies signal degradation  
                  **threshold ber-sf** — specifies the BER that specifies signal failure  
                  *threshold-rate* — specifies the number of errors, in millions

**Values**     1, 5, 10, 50, 100

### 3.13.2.25 DS1 and E1 Channel Group Commands

#### channel-group

|                    |                                                                                                                                                                                                             |               |                             |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------------------|
| <b>Syntax</b>      | <b>[no] channel-group</b> <i>channel-group-id</i>                                                                                                                                                           |               |                             |
| <b>Context</b>     | config>port>tdm>ds1<br>config>port>tdm>e1                                                                                                                                                                   |               |                             |
| <b>Description</b> | This command creates DS0 channel groups in a channelized DS1 or E1 circuit. Channel groups cannot be further subdivided.<br><br>The <b>no</b> form of this command deletes the specified DS1 or E1 channel. |               |                             |
| <b>Default</b>     | n/a                                                                                                                                                                                                         |               |                             |
| <b>Parameters</b>  | <i>channel-group-id</i> — identifies the channel group ID number<br><br><table> <tr> <td><b>Values</b></td><td>DS1: 1 to 24<br/>E1: 1 to 32</td></tr> </table>                                              | <b>Values</b> | DS1: 1 to 24<br>E1: 1 to 32 |
| <b>Values</b>      | DS1: 1 to 24<br>E1: 1 to 32                                                                                                                                                                                 |               |                             |

#### crc

|                    |                                                                                                                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>crc {16   32}</b>                                                                                                                                                                                 |
| <b>Context</b>     | config>port>tdm>ds1>channel-group<br>config>port>tdm>e1>channel-group                                                                                                                                |
| <b>Description</b> | This command configures the precision of the cyclic redundancy check (CRC). Non-ATM channel groups configured under DS1 or E1 support 16-bit checksum. ATM channel groups support a 32-bit checksum. |
| <b>Default</b>     | 16                                                                                                                                                                                                   |
| <b>Parameters</b>  | <b>16</b> — use 16-bit checksum for the associated port/channel<br><b>32</b> — use 32-bit checksum for the associated port/channel                                                                   |

## encap-type

- Syntax** **encap-type** {atm | cem | ipcp | ppp-auto | frame-relay | cisco-hdlc | hdlc}  
**no encap-type**
- Context** config>port>tdm>ds1>channel-group  
 config>port>tdm>e1>channel-group
- Description** This command configures the encapsulation method used for the port on the 16-port T1/E1 ASAP Adapter card, 32-port T1/E1 ASAP Adapter card, 2-port OC3/STM1 Channelized Adapter card, 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card, 4-port DS3/E3 Adapter card (DS3 ports only), or 4-port T1/E1 and RS-232 Combination module (T1/E1 ports only). This parameter can be set on both access and network ports.
- For access mode, the supported encapsulation types are **atm**, **cem**, **frame-relay**, **cisco-hdlc**, **hdlc**, and **ipcp**. [Table 28](#) lists the adapter cards and the corresponding encapsulation types.

**Table 28 Adapter Cards and Encapsulation Types in Access Mode**

| Adapter Card                                    | Encapsulation Type |     |             |            |      |      |
|-------------------------------------------------|--------------------|-----|-------------|------------|------|------|
|                                                 | atm                | cem | frame-relay | cisco-hdlc | hdlc | ipcp |
| 16-port T1/E1 ASAP Adapter card, version 1      | ✓                  | ✓   |             |            |      | ✓    |
| 16-port T1/E1 ASAP Adapter card, version 2      | ✓                  | ✓   | ✓           | ✓          | ✓    | ✓    |
| 32-port T1/E1 ASAP Adapter card                 | ✓                  | ✓   | ✓           | ✓          | ✓    | ✓    |
| 2-port OC3/STM1 Channelized Adapter card        | ✓                  | ✓   |             |            |      | ✓    |
| 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card |                    | ✓   |             |            |      |      |
| 4-port DS3/E3 Adapter card (DS3 ports only)     |                    | ✓   | ✓           |            |      |      |
| 4-port T1/E1 and RS-232 Combination module      |                    | ✓   |             |            |      | ✓    |

For network mode, only **ppp-auto** encapsulation is supported.

To change the **encap-type**, the channel group must first be deleted, then reconfigured with the new **encap-type**.

---

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | no encaps-type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Parameters</b> | <p><b>atm</b> — specifies the encapsulation type as ATM for ATM pseudowires</p> <p><b>cem</b> — specifies the encapsulation type as circuit emulation mode (CEM) for TDM pseudowires</p> <p><b>frame-relay</b> — specifies the encapsulation type as frame relay</p> <p><b>cisco-hdlc</b> — specifies the encapsulation type as Cisco HDLC</p> <p><b>hdlc</b> — specifies the encapsulation type as HDLC</p> <p><b>ipcp</b> — specifies the encapsulation type as IPCP for a PPP/MLPPP channel group in access mode on the 2-port OC3/STM1 Channelized Adapter card, 16-port T1/E1 ASAP Adapter card, 32-port T1/E1 ASAP Adapter card, or 4-port T1/E1 and RS-232 Combination module. IPCP is not supported on fractional T1/E1 channels on a 2-port OC3/STM1 Channelized Adapter card.</p> <p><b>ppp-auto</b> — specifies the encapsulation type as PPP for PPP/MLPPP bundles in network mode.</p> |

## idle-cycle-flag

|                    |                                                                                                                                                                                                                                                                                        |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>idle-cycle-flag {flags   ones}</b><br><b>no idle-cycle-flag</b>                                                                                                                                                                                                                     |
| <b>Context</b>     | config>port>tdm>ds1>channel-group<br>config>port>tdm>e1>channel-group                                                                                                                                                                                                                  |
| <b>Description</b> | <p>This command configures the value that the DS0, DS1, DS3, E1, or TDM interface transmits during idle cycles. This command is applicable only if the encapsulation type is ppp-auto.</p> <p>The <b>no</b> form of this command changes the idle cycle flag to the default value.</p> |
| <b>Default</b>     | flags (0x7E)                                                                                                                                                                                                                                                                           |
| <b>Parameters</b>  | <p><b>flags</b> — use 0x7E as the idle cycle flag</p> <p><b>ones</b> — use 0xFF as the idle cycle flag</p>                                                                                                                                                                             |

## idle-payload-fill

|                |                                                                                             |
|----------------|---------------------------------------------------------------------------------------------|
| <b>Syntax</b>  | <b>idle-payload-fill {all-ones   pattern <i>pattern</i>}</b><br><b>no idle-payload-fill</b> |
| <b>Context</b> | config>port>tdm>ds1>channel-group<br>config>port>tdm>e1>channel-group                       |

**Description** This command defines the data pattern to be transmitted (8-bit value) when the circuit emulation service is not operational or temporarily experiences underrun conditions. This command is only valid for CESoPSN services.



**Note:** See the 7705 SAR Services Guide for information on CESoPSN services.

**Default** all-ones

**Parameters** **all-ones** — transmits 11111111  
*pattern* — transmits the user-defined pattern

**Values** 0 to 255 (can be entered in decimal, binary, or hexadecimal format)

## idle-signal-fill

**Syntax** **idle-signal-fill** {**all-ones** | **pattern** *pattern*}  
**no idle-signal-fill**

**Context** config>port>tdm>ds1>channel-group  
 config>port>tdm>e1>channel-group

**Description** This command defines the signaling pattern to be transmitted (4-bit value) when the circuit emulation service is not operational or temporarily experiences underrun conditions. This command is only valid for CES with CAS.



**Note:** See the 7705 SAR Services Guide for information on CESoPSN services.

**Default** all-ones

**Parameters** **all-ones** — transmits 1111  
*pattern* — transmits the user-defined pattern

**Values** 0 to 15 (can be entered in decimal, binary, or hexadecimal format)

## mac

**Syntax** **mac** *ieee-address*  
**no mac**

**Context** config>port>tdm>ds1>channel-group

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                    | <pre>config&gt;port&gt;tdm&gt;e1&gt;channel-group config&gt;port&gt;tdm&gt;ds3</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | <p>This command assigns a specific MAC address to an APS port. When the command is issued while the port is operational, IP will issue an ARP, if appropriate, and BPDUs are sent with the new MAC address. Configuring a MAC address using the <b>mac</b> command is only supported for APS channel groups. Physical channel groups do not support the <b>mac</b> command.</p> <p>The <b>no</b> form of this command removes the configured MAC address. The physical port MAC address will be used instead.</p> <p>For TDM ports, configuring the MAC address allows the same MAC address to be assigned to ports across two routers in an MC-APS pair for MEF 8.</p> <p>The <b>mac</b> command is only supported on the 2-port OC3/STM1 Channelized Adapter card and 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card.</p> |
| <b>Default</b>     | no mac                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Parameters</b>  | <p><i>ieee-address</i> — specifies the 48-bit MAC address in the form aa:bb:cc:dd:ee:ff or aa-bb-cc-dd-ee-ff where aa, bb, cc, dd, ee, and ff are hexadecimal numbers. Allowed values are any non-broadcast, non-multicast MAC, and non-IEEE reserved MAC addresses.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

## mode

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <pre>mode {access   network} no mode</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Context</b>     | <pre>config&gt;port&gt;tdm&gt;ds1&gt;channel-group config&gt;port&gt;tdm&gt;e1&gt;channel-group</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | <p>This command configures a TDM channel for access or network mode operation.</p> <p>An <b>access</b> port or channel is used for customer-facing traffic on which services are configured. A Service Access Point (SAP) can only be configured on an access port or channel.</p> <p>When a port is configured for access mode, the appropriate <b>encap-type</b> must be specified to distinguish the services on the port. Once a TDM channel has been configured for access mode, multiple services can be configured on the TDM channel.</p> <p>A <b>network</b> port or channel participates in the service provider transport or infrastructure network when a network mode is selected. When the network option is configured, only the ppp-auto <b>encap-type</b> can be configured for the port or channel.</p> <p>The <b>no</b> form of this command restores the default.</p> |
| <b>Default</b>     | access                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |



- Parameters**    **access** — configures the port or channel as service access  
                       **network** — configures the port or channel for transport network use

## mtu

- Syntax**        **mtu** *mtu-bytes*  
                       **no mtu**
- Context**        config>port>tdm>ds1>channel-group  
                       config>port>tdm>e1>channel-group
- Description**    This command configures the maximum payload MTU size for a port.
- Packets received that are larger than the MTU will be fragmented or discarded, depending on whether the DF bit is set in the packet header. If the port mode or encapsulation type is changed, the MTU assumes the default values of the new mode or encapsulation type.
- The **no** form of this command restores the default values.
- Default**         The default MTU value depends on the port type, mode, and encapsulation as listed in the following table.
- Parameters**    *mtu-bytes* — sets the maximum allowable size of the MTU, expressed as an integer
- Values**        512 to 2090 bytes (see [Table 29](#))

**Table 29**        **Default and Maximum Port MTU**

| Port Type                 | Mode    | Encap Type  | Default (Bytes) | Max MTU (Bytes) |
|---------------------------|---------|-------------|-----------------|-----------------|
| TDM (PW)                  | Access  | cem         | 1514            | 1514            |
| TDM (ATM PW)              | Access  | atm         | 1524            | 1524            |
| TDM (FR PW)               | Access  | frame-relay | 1514            | 2090            |
| TDM (HDLC PW)             | Access  | hdlc        | 1514            | 2090            |
| TDM (IW PW)               | Access  | cisco-hdlc  | 1514            | 2090            |
| TDM (PPP/MLPPP)           | Access  | ipcp        | 1502            | 2090            |
| TDM (PPP/MLPPP)           | Network | ppp-auto    | 1572            | 2090            |
| Serial V35 or X21 (FR PW) | Access  | frame-relay | 1514            | 2090            |
| SONET/SDH                 | Access  | atm         | 1524            | 1524            |
| SONET/SDH                 | Network | ppp-auto    | 1572            | 2090            |

## ppp

|                    |                                                                                                                                                                                                                   |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] ppp</b>                                                                                                                                                                                                   |
| <b>Context</b>     | config>port>tdm>ds1>channel-group<br>config>port>tdm>e1>channel-group                                                                                                                                             |
| <b>Description</b> | This command enables access to the context to configure the LCP operational parameters for a DS1 or E1 channel or a DS0 channel.<br><br>The <b>no</b> form of the command removes the LCP operational parameters. |
| <b>Default</b>     | no ppp                                                                                                                                                                                                            |

## ber-sf-link-down

|                    |                                                                                                                                                                                                                     |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>ber-sf-link-down</b><br><b>no ber-sf-link-down</b>                                                                                                                                                               |
| <b>Context</b>     | config>port>tdm>ds1>channel-group>ppp<br>config>port>tdm>e1>channel-group>ppp                                                                                                                                       |
| <b>Description</b> | This command enables the channel-group down on BER-SF alarm. When enabled, the channel-group will be placed out of service once BER-SF is detected.<br><br>The <b>no</b> form of this command disables the feature. |
| <b>Default</b>     | no ber-sf-link-down                                                                                                                                                                                                 |

## keepalive

|                    |                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>keepalive</b> <i>time-interval</i> [ <b>dropcount</b> <i>drop-count</i> ]<br><b>no keepalive</b>                                |
| <b>Context</b>     | config>port>tdm>ds1>channel-group>ppp<br>config>port>tdm>e1>channel-group>ppp                                                      |
| <b>Description</b> | This command sets the keepalive interval.<br><br>The <b>no</b> form of this command returns the interval to the default value.     |
| <b>Default</b>     | keepalive 10 dropcount 3                                                                                                           |
| <b>Parameters</b>  | <i>time-interval</i> — the time in seconds between keepalive messages, expressed as a decimal integer<br><br><b>Values</b> 1 to 60 |

*drop-count* — the number of consecutive keepalive failed request attempts or remote replies that can be missed after which the port is operationally downed

**Values** 1 to 255

## scramble

|                    |                                                                                                                             |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] scramble</b>                                                                                                        |
| <b>Context</b>     | config>port>tdm>ds1>channel-group<br>config>port>tdm>e1>channel-group                                                       |
| <b>Description</b> | This command enables payload scrambling on channel groups. The command is applicable only if the encapsulation type is atm. |

## timeslots

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>timeslots</b> <i>timeslots</i><br><b>no timeslots</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | config>port>tdm>ds1>channel-group<br>config>port>tdm>e1>channel-group                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Description</b> | <p>This command defines the list of DS0 timeslots to be used in the DS1 or E1 channel group. The timeslots do not need to be consecutive. If the encapsulation type is changed to or from atm, the timeslots are reset to the default. If the encapsulation type is set to atm, the timeslot ranges are automatically configured and cannot be changed.</p> <p>If the port is configured for fractional T1/E1 (see <a href="#">Configuring Fractional T1/E1 Ports for PPP Encapsulation</a>), this command is used to specify the number of timeslots to be used on the port. Only the specified timeslots can be used.</p> <p>The <b>no</b> form of this command removes DS0 timeslots from a channel group.</p> |
| <b>Default</b>     | <p>no timeslots — non-ATM channel groups</p> <p>1 to 24 — channel groups configured under DS1 with atm encapsulation</p> <p>2 to 16, 18 to 32 — channel groups configured under E1 with atm encapsulation</p> <p>2 to 32 — channel groups configured under E1 (ppp-auto)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Parameters</b>  | <p><i>timeslots</i> — specifies the timeslots to be associated with the channel group. The value can consist of a list of timeslots. Each member of the list can either be a single timeslot or a range of timeslots.</p> <p><b>Values</b> 1 to 24 for DS1 interfaces. The full range is automatically configured for ATM channel groups and cannot be changed.</p> <p>2 to 32 for E1 interfaces. The 2 to 16 and 18 to 32 ranges are automatically configured for ATM channel groups and cannot be changed.</p>                                                                                                                                                                                                  |

### 3.13.2.26 DS3 and E3 Commands

#### clock-source

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>clock-source</b> { <b>loop-timed</b>   <b>node-timed</b>   <b>differential</b>   <b>free-run</b> }                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>port>tdm>ds3<br>config>port>tdm>e3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Description</b> | <p>This command specifies the clock source to be used for the link transmit timing.</p> <p>The clock source setting also determines the node sync reference if the port is configured as one of the node synchronization references (<b>config&gt;system&gt;sync-if-timing&gt;{ref1   ref2}&gt;source-port</b> command). Refer to the 7705 SAR Basic System Configuration Guide, “Node Timing”, for more information.</p>                                                                                                                                                                                                                                                                                                                                                             |
| <b>Default</b>     | <p>node-timed (for the 4-port DS3/E3 Adapter card)</p> <p>loop-timed (for all other applicable adapter cards)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Parameters</b>  | <p><b>loop-timed</b> — the link recovers the clock from the received data stream</p> <p><b>node-timed</b> — the link uses the internal clock when transmitting data (this parameter does not apply to the 2-port OC3/STM1 Channelized Adapter card)</p> <p><b>differential</b> — clocking is derived from a common clock compared to differential clock recovery (DCR) data in the RTP header in the TDM PW overhead. DCR must also be enabled on the relevant card, module, or chassis with the <a href="#">clock-mode</a> command. This parameter applies only to DS3/E3 ports on the 4-port DS3/E3 Adapter card.</p> <p><b>free-run</b> — timing source is from its own clock, not an external timing source (this parameter does not apply to the 4-port DS3/E3 Adapter card)</p> |

#### crc

|                    |                                                                                                                                                                                                                                                                                          |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>crc</b> { <b>16</b>   <b>32</b> }                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>port>tdm>ds3<br>config>port>tdm>e3                                                                                                                                                                                                                                                |
| <b>Description</b> | <p>This command configures the precision of the cyclic redundancy check (CRC). Non-ATM ports support a 16-bit checksum and ATM ports support a 32-bit checksum. CRC applies to PPP applications only on the 2-port OC3/STM1 Channelized Adapter card and 4-port DS3/E3 Adapter card.</p> |
| <b>Default</b>     | <p>16 (non-ATM ports)</p> <p>32 (ATM ports)</p>                                                                                                                                                                                                                                          |

- Parameters**
- 16** — use 16-bit checksum for the associated port
  - 32** — use 32-bit checksum for the associated port

## encap-type

- Syntax** **encap-type {atm | cem | ppp-auto | frame-relay}**  
**no encap-type**
- Context** config>port>tdm>ds3  
 config>port>tdm>e3
- Description** This command configures the encapsulation method used on the specified DS3/E3 port.
- To change the **encap-type**, the port must first be deleted, then reconfigured with the new **encap-type**.
- Default** no encap-type
- Parameters**
- atm** — specifies the encapsulation type as ATM
  - cem** — specifies the encapsulation type as circuit emulation mode (CEM) for TDM pseudowires
  - ppp-auto** — specifies the encapsulation type as PPP. The activation of IPCP and MPLSCP is automatically enabled depending on the protocol configuration. This encapsulation type is only valid on DS3 and E3 ports in network mode.
  - frame-relay** — specifies the encapsulation type as frame relay

## feac-loop-respond

- Syntax** **[no] feac-loop-respond**
- Context** config>port>tdm>ds3  
 config>port>tdm>e3
- Description** This command enables the DS3/E3 interface to respond to remote loop signals. The DS3/E3 far-end alarm and control (FEAC) signal is used to send alarm or status information from the far-end terminal back to the local terminal. DS3/E3 loopbacks at the far-end terminal from the local terminal are initiated.
- The **no** form of this command prevents the DS3/E3 interface from responding to remote loop signals.
- Default** no feac-loop-respond

## framing (DS3)

|                    |                                                                                                                  |
|--------------------|------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>framing {c-bit   m23}</b>                                                                                     |
| <b>Context</b>     | config>port>tdm>ds3                                                                                              |
| <b>Description</b> | This command specifies DS3 framing for the associated DS3 port.                                                  |
| <b>Default</b>     | c-bit                                                                                                            |
| <b>Parameters</b>  | <b>c-bit</b> — configures the DS3 port for C-bit framing<br><b>m23</b> — configures the DS3 port for M23 framing |

## framing (E3)

|                    |                                                               |
|--------------------|---------------------------------------------------------------|
| <b>Syntax</b>      | <b>framing g751</b>                                           |
| <b>Context</b>     | config>port>tdm>e3                                            |
| <b>Description</b> | This command specifies E3 framing for the associated E3 port. |
| <b>Default</b>     | g751 (this default cannot be changed)                         |
| <b>Parameters</b>  | <b>g751</b> — configures the E3 port for g751 framing         |

## idle-cycle-flag

|                    |                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>idle-cycle-flag {flags   ones}</b><br><b>no idle-cycle-flag</b>                                                                                                                                                                                                                                                                                   |
| <b>Context</b>     | config>port>tdm>ds3<br>config>port>tdm>e3                                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | This command configures the value that the DS3/E3 interface transmits during idle cycles. This command is applicable only if the encapsulation type is ppp-auto. For ATM ports, the configuration does not apply and only the <b>no</b> form is accepted.<br><br>The <b>no</b> form of this command resets the idle cycle flag to the default value. |
| <b>Default</b>     | flags (0x7E)<br>no idle-cycle-flag (for ATM)                                                                                                                                                                                                                                                                                                         |
| <b>Parameters</b>  | <b>flags</b> — use 0x7E as the idle cycle flag<br><b>ones</b> — use 0xFF as the idle cycle flag                                                                                                                                                                                                                                                      |

## loopback

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>loopback</b> { <b>line</b>   <b>internal</b>   <b>remote</b> }<br><b>no loopback</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | config>port>tdm>ds3<br>config>port>tdm>e3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | <p>This command puts the specified DS3/E3 port into a loopback mode.</p> <p>A line loopback loops frames received on the corresponding port or channel back towards the transmit (egress) direction before reaching the framer.</p> <p>An internal loopback loops the frames that are coming in an egress direction from the fabric towards the framer, back to the fabric. This is usually referred to as an equipment loopback.</p> <p>A remote loopback sends a signal to the remote device to provide a line loopback. To configure a remote loopback, you must enable <a href="#">feac-loop-respond</a> on the far-end DS3/E3 interface, then set the loopback to remote on the near-end DS3/E3 interface. Remote loopback sends a loopback code to the far-end DS3/E3 interface that results in the far end sending out a line loopback.</p> <p>The loopback command is not saved to the system configuration.</p> <p>The <b>no</b> form of this command disables loopback on the DS3/E3 port.</p> |
| <b>Default</b>     | no loopback                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Parameters</b>  | <p><b>line</b> — places the associated DS3/E3 port into line loopback mode</p> <p><b>internal</b> — places the associated DS3/E3 port into internal loopback mode</p> <p><b>remote</b> — places the associated DS3/E3 port into remote loopback mode</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

## mdl

|                    |                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mdl</b> { <b>eic</b>   <b>lic</b>   <b>fic</b>   <b>unit</b>   <b>pfi</b>   <b>port</b>   <b>gen</b> } <i>mdl-string</i><br><b>no mdl</b>                                                                                                                                                                                                                             |
| <b>Context</b>     | config>port>tdm>ds3                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b> | <p>This command configures the maintenance data link (MDL) message for a DS3 port or channel. This command is only applicable if the DS3 port or channel is using C-bit framing, specified using the <a href="#">framing (DS3)</a> command.</p> <p>The <b>no</b> form of this command removes the mdl-string association and stops the transmission of MDL messages.</p> |
| <b>Default</b>     | no mdl                                                                                                                                                                                                                                                                                                                                                                   |

---

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Parameters</b> | <i>mdl-string</i> — specifies an MDL message up to 38 characters long<br><b>eic</b> — specifies the equipment ID code up to 10 characters long<br><b>lic</b> — specifies the line ID code up to 11 characters long<br><b>fic</b> — specifies the frame ID code up to 10 characters long<br><b>unit</b> — specifies the unit ID code up to 6 characters long<br><b>pfi</b> — specifies the facility ID code up to 38 characters long<br><b>port</b> — specifies the port ID code up to 38 characters long<br><b>gen</b> — specifies the generator number to send in the MDL test signal message, up to 38 characters long |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## mdl-transmit

|                    |                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] mdl-transmit {path   idle-signal   test-signal}</b>                                                                                                                                                                                                                                                                                              |
| <b>Context</b>     | config>port>tdm>ds3                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b> | <p>This command enables the transmission of an MDL message on a DS3 port or channel. This command is only applicable if the DS3 port or channel is using C-bit framing, specified using the <a href="#">framing (DS3)</a> command.</p> <p>The <b>no</b> form of this command prevents the transmission of an MDL message on the DS3 port or channel.</p> |
| <b>Default</b>     | no mdl-transmit                                                                                                                                                                                                                                                                                                                                          |
| <b>Parameters</b>  | <b>path</b> — specifies the MDL path message<br><b>idle-signal</b> — specifies the MDL idle signal message<br><b>test-signal</b> — specifies the MDL test signal message                                                                                                                                                                                 |

## mode

|                    |                                                                                                                                                                                                                                                                                |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mode {access   network}</b><br><b>no mode</b>                                                                                                                                                                                                                               |
| <b>Context</b>     | config>port>tdm>ds3<br>config>port>tdm>e3                                                                                                                                                                                                                                      |
| <b>Description</b> | <p>This command configures a DS3/E3 port for access or network mode of operation.</p> <p>SAPs can only be configured on access ports. When a DS3/E3 port is configured for access mode, the <b>encap-type</b> can be set to <b>atm</b>, <b>cem</b>, or <b>frame-relay</b>.</p> |



A network port is used as an uplink to connect to the packet network and transport the PPP services. Network mode applies to DS3 and E3 ports. When a DS3/E3 port is configured for network mode, the **encap-type** must be set to **ppp-auto**.

The mode can be changed between access and network provided that **encap-type** has not been configured yet. If **encap-type** has been configured, the DS3/E3 port must be first deleted and then reconfigured with the required **encap-type**.

The **no** form of this command reverts to the default.

|                   |                                                                                                                   |
|-------------------|-------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | access                                                                                                            |
| <b>Parameters</b> | <b>access</b> — configures the port as service access<br><b>network</b> — configures the port as a network uplink |

## mtu

|                    |                                                                                                                                                                                                                                                                                                                  |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mtu</b> <i>mtu-bytes</i><br><b>no mtu</b>                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>port>tdm>ds3<br>config>port>tdm>e3                                                                                                                                                                                                                                                                        |
| <b>Description</b> | This command configures the maximum payload MTU size for a DS3/E3 port configured for PPP. Packets that are received larger than the MTU are discarded. Packets that cannot be fragmented at egress and exceed the MTU are also discarded.<br><br>The <b>no</b> form of this command restores the default value. |
| <b>Default</b>     | 1572 (for ppp-auto)                                                                                                                                                                                                                                                                                              |
| <b>Parameters</b>  | <i>mtu-bytes</i> — sets the maximum allowable size of the MTU, expressed as an integer<br><b>Values</b> 512 to 2090 (in bytes)                                                                                                                                                                                   |

## ppp

|                    |                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>ppp</b>                                                                                                |
| <b>Context</b>     | config>port>tdm>ds3<br>config>port>tdm>e3                                                                 |
| <b>Description</b> | This command enables access to the context to configure the LCP operational parameters for a DS3/E3 port. |

## keepalive

|                    |                                                                                                                                                                                                                                                                                                                                         |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>keepalive</b> <i>time-interval</i> [ <b>dropcount</b> <i>drop-count</i> ]<br><b>no keepalive</b>                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>port>tdm>ds3>ppp<br>config>port>tdm>e3>ppp                                                                                                                                                                                                                                                                                       |
| <b>Description</b> | This command sets the interval between keepalive messages.<br><br>The <b>no</b> form of this command returns the interval to the default value.                                                                                                                                                                                         |
| <b>Default</b>     | keepalive 10 dropcount 3                                                                                                                                                                                                                                                                                                                |
| <b>Parameters</b>  | <i>time-interval</i> — the time in seconds between keepalive messages, expressed as a decimal integer<br><br><b>Values</b> 1 to 60<br><br><i>drop-count</i> — the number of consecutive keepalive failed request attempts or remote replies that can be missed before the port becomes operationally down<br><br><b>Values</b> 1 to 255 |

## report-alarm

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | [ <b>no</b> ] <b>report-alarm</b> { <b>ais</b>   <b>los</b>   <b>oof</b>   <b>rai</b>   <b>looped</b> }                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Context</b>     | config>port>tdm>ds3<br>config>port>tdm>e3                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b> | This command enables logging of DS3 and E3 alarms for a DS3/E3 port or channel. When configured, logging is enabled for the raising and clearing of the specified alarms.<br><br>The <b>no</b> form of this command disables logging of the specified alarms.                                                                                                                                                                                                                       |
| <b>Parameters</b>  | <b>ais</b> — reports alarm indication signal errors<br><b>Default</b> ais alarms are issued<br><b>los</b> — reports loss of signal errors<br><b>Default</b> los alarms are issued<br><b>oof</b> — reports out-of-frame errors<br><b>Default</b> oof alarms are not issued<br><b>rai</b> — reports remote alarm indication signal errors<br><b>Default</b> rai alarms are not issued<br><b>looped</b> — reports looped packets errors<br><b>Default</b> looped alarms are not issued |

---

### 3.13.2.27 Voice Commands

#### voice

|                    |                                                                                                                                                                                                                                  |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>voice</b>                                                                                                                                                                                                                     |
| <b>Context</b>     | config>port                                                                                                                                                                                                                      |
| <b>Description</b> | This command enables the context to configure voice port parameters. This context can only be accessed on the 6-port E&M Adapter card, 8-port Voice & Teleprotection card, 8-port FXO Adapter card, and 6-port FXS Adapter card. |
| <b>Default</b>     | n/a                                                                                                                                                                                                                              |

#### audio-wires

|                    |                                                                                                                                                                                                                                                              |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>audio-wires</b> { <b>four-wires</b>   <b>two-wires</b> }                                                                                                                                                                                                  |
| <b>Context</b>     | config>port>voice                                                                                                                                                                                                                                            |
| <b>Description</b> | <p>This command configures the number of audio wires to be used for audio transmission for an E&amp;M interface.</p> <p>A change in the number of audio wires may also require a change in the <a href="#">tlp-rx</a> and <a href="#">tlp-tx</a> values.</p> |
| <b>Default</b>     | four-wires                                                                                                                                                                                                                                                   |
| <b>Parameters</b>  | <p><b>four-wires</b> — four-wire operation</p> <p><b>two-wires</b> — two-wire operation. This parameter is not valid if the corresponding port or channel's signaling type is 4W transmission.</p>                                                           |

#### em

|                    |                                                                                                                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] em</b>                                                                                                                                                                                        |
| <b>Context</b>     | config>port>voice                                                                                                                                                                                     |
| <b>Description</b> | <p>This command enables the context to configure channel group parameters for a channelized E&amp;M voice interface.</p> <p>The <b>no</b> form of this command deletes the E&amp;M channel group.</p> |
| <b>Default</b>     | n/a                                                                                                                                                                                                   |

## fault-signaling

**Syntax** **fault-signaling** {**idle** | **seized**}

**Context**  
 config>port>voice>em  
 config>port>voice>fxo  
 config>port>voice>fxs

**Description** This command configures a voice channel for idle or seized fault signaling.

On the 6-port E&M Adapter card, this command is valid only if [signaling-mode](#) is configured for E&M signaling. The 6-port E&M Adapter card also supports configuration of the idle and seized codes.

Configuration of the idle and seized codes is not supported on the FXO and FXS channels on the 8-port Voice & Teleprotection card, or on the 8-port FXO Adapter card or 6-port FXS Adapter card. The code transmitted depends on signaling type and companding law as shown in [Table 30](#).

**Table 30** Idle and Seized Codes for FXO and FXS Signaling Types

| Signaling Type          | Companding Law |        | ABCD code |        |
|-------------------------|----------------|--------|-----------|--------|
|                         | A-Law          | Mu-Law | Idle      | Seized |
| 3600plar (FXS only)     | ✓              |        | 1101      | 0101   |
| 3600plar (FXS only)     |                | ✓      | 11        | 00     |
| 1511plar (FXS only)     | ✓              |        | 1101      | 0101   |
| 1511profile1 (FXO, FXS) | ✓              |        | 1101      | 0101   |
| 3600ls (FXO, FXS)       |                | ✓      | 01        | 11     |
| 3600re (FXO, FXS)       | ✓              |        | 1101      | 0101   |

**Default** idle

**Parameters**  
**idle** — specifies idle fault signaling  
**seized** — specifies seized fault signaling

## fxo

|                    |                                                                                                                                                                                                                                                                                     |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] fxo</b>                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>port>voice                                                                                                                                                                                                                                                                   |
| <b>Description</b> | <p>This command creates a Foreign Exchange Office (FXO) channel on a channelized voice interface. This command applies to the 8-port FXO Adapter card and the 8-port Voice &amp; Teleprotection Card.</p> <p>The <b>no</b> form of this command deletes the port's FXO channel.</p> |
| <b>Default</b>     | n/a                                                                                                                                                                                                                                                                                 |

## fxs

|                    |                                                                                                                                                                                                                                                                                     |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] fxs</b>                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>port>voice                                                                                                                                                                                                                                                                   |
| <b>Description</b> | <p>This command creates a Foreign Exchange Subscriber (FXS) channel on a channelized voice interface. This command applies to the 8-port Voice &amp; Teleprotection card and 6-port FXS Adapter card.</p> <p>The <b>no</b> form of this command deletes the port's FXS channel.</p> |
| <b>Default</b>     | n/a                                                                                                                                                                                                                                                                                 |

## idle-code

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>idle-code</b> <i>abcd-code</i><br><b>no idle-code</b>                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Context</b>     | config>port>voice>em                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | <p>This command defines the ABCD signaling code to be transmitted when the voice channel is configured to transmit idle fault signaling. The command is also used for driving/scanning the E&amp;M signaling leads.</p> <p>This command is valid only on the 6-port E&amp;M Adapter card and only if <a href="#">signaling-mode</a> is configured for E&amp;M signaling.</p> <p>The <b>no</b> form of this command reverts to the default value.</p> |
| <b>Default</b>     | 0 (for Mu-Law companding)<br>13 (for A-Law companding)                                                                                                                                                                                                                                                                                                                                                                                               |

---

|                   |                                                                    |
|-------------------|--------------------------------------------------------------------|
| <b>Parameters</b> | <i>abcd-code</i> — the 4-bit ABCD value to be transmitted          |
| <b>Values</b>     | 0 to 15 (can be entered in decimal, binary, or hexadecimal format) |

## line-balance

|                    |                                                                                                                                                                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>line-balance</b> { <b>nominal</b>   <b>800</b> }                                                                                                                                                                                                |
| <b>Context</b>     | config>port>voice                                                                                                                                                                                                                                  |
| <b>Description</b> | This command configures the line balance for the FXO or FXS voice interface on the 8-port Voice & Teleprotection card, for the FXO voice interface on the 8-port FXO Adapter card, and for the FXS voice interface on the 6-port FXS Adapter card. |
| <b>Default</b>     | nominal (for both FXS and FXO)                                                                                                                                                                                                                     |
| <b>Parameters</b>  | <b>nominal</b> — 600 $\Omega$<br><b>800</b> — 800 $\Omega$ /(100 $\Omega$ +50 nF)                                                                                                                                                                  |

## loopback

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>loopback</b> { <b>internal-analog</b>   <b>internal-digital</b> }<br><b>no loopback</b>                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | config>port>voice>em<br>config>port>voice>fxo<br>config>port>voice>fxs                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | This command puts the specified port or channel in loopback mode. The internal-digital parameter is the only valid option for FXO and FXS.<br><br>The <b>loopback</b> command is not saved to the system configuration between boots.<br><br>The <b>no</b> form of this command disables the loopback.                                                                                                                                                                                            |
| <b>Default</b>     | no loopback                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Parameters</b>  | <b>internal-analog</b> — places the associated port or channel into an internal analog loopback mode. The internal analog loopback resides in the CODEC, close to the line side. It loops the outgoing analog signals back towards the system.<br><br><b>internal-digital</b> — places the associated port or channel into an internal digital loopback mode. The internal digital loopback resides in the CODEC, close to the system side. It loops the outgoing frames back towards the system. |

## ring-generation

|                    |                                                                                                                                                                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>ring-generation</b> { <b>16</b>   <b>20</b>   <b>25</b> }<br><b>no ring-generation</b>                                                                                                                                                       |
| <b>Context</b>     | config>port>voice                                                                                                                                                                                                                               |
| <b>Description</b> | <p>This command configures the frequency of the generated ring signal for the specified FXS voice port.</p> <p>This command does not apply to FXO or E&amp;M ports.</p> <p>The <b>no</b> form of this command reverts to the default value.</p> |
| <b>Default</b>     | 16                                                                                                                                                                                                                                              |
| <b>Parameters</b>  | <b>16</b> — 16 Hz ring signal<br><b>20</b> — 20 Hz ring signal<br><b>25</b> — 25 Hz ring signal                                                                                                                                                 |

## seized-code

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>seized-code</b> <i>abcd-code</i><br><b>no seized-code</b>                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>port>voice>em                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Description</b> | <p>This command defines the ABCD signaling code to be transmitted when the channel is configured to transmit seized fault signaling. The command is also used for driving/scanning the E&amp;M signaling leads.</p> <p>This command is valid only on the 6-port E&amp;M Adapter card and only if <a href="#">signaling-mode</a> is configured for E&amp;M signaling.</p> <p>The <b>no</b> form of this command reverts to the default value.</p> |
| <b>Default</b>     | 0 (for Mu-Law companding)<br>13 (for A-Law companding)                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Parameters</b>  | <i>abcd-code</i> — the 4-bit ABCD value to be transmitted                                                                                                                                                                                                                                                                                                                                                                                        |

## signaling-type

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>signaling-type</b> { <b>3600plar</b>   <b>1511plar</b>   <b>3600ls</b>   <b>1511profile1</b>   <b>3600re</b> }                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>port>voice                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b> | <p>This command configures how the signaling leads operate to establish a call. To change this parameter, the voice channel must be shut down first.</p> <p>For FXO, <b>3600ls</b>, <b>1511profile1</b>, and <b>3600re</b> are the only valid options; <b>1511profile1</b> and <b>3600re</b> support A-Law companding, and <b>3600ls</b> supports Mu-Law companding.</p> <p>For FXS, all signaling types are supported; <b>3600plar</b> supports both A-Law and Mu-Law companding, <b>1511plar</b>, <b>1511profile1</b>, and <b>3600re</b> support A-Law companding, and <b>3600ls</b> supports Mu-Law companding.</p> |
| <b>Default</b>     | <p>3600ls (for Mu-Law companding)</p> <p>3600re (for A-Law companding)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Parameters</b>  | <p><b>3600plar</b> — private line automatic ringdown</p> <p><b>1511plar</b> — private line automatic ringdown</p> <p><b>3600ls</b> — loop start</p> <p><b>1511profile1</b> — 1511 loop start</p> <p><b>3600re</b> — remote extension</p>                                                                                                                                                                                                                                                                                                                                                                               |

## signaling-lead

|                    |                                                                                                             |
|--------------------|-------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>signaling-lead</b>                                                                                       |
| <b>Context</b>     | config>port>voice>em                                                                                        |
| <b>Description</b> | This command enables the context to configure the input and output leads, which carry call control signals. |
| <b>Default</b>     | n/a                                                                                                         |

## e

|                    |                                                                                                                                                                                                                  |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>e</b> { <b>high</b>   <b>low</b>   <b>end-to-end</b> }                                                                                                                                                        |
| <b>Context</b>     | config>port>voice>em>signaling-lead                                                                                                                                                                              |
| <b>Description</b> | <p>This command configures the output signaling lead known as the E-lead (Ear, Earth, or Exchange).</p> <p>This command is valid only if <a href="#">signaling-mode</a> is configured for E&amp;M signaling.</p> |



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|                   |                                                                                                                                                                                                                                           |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | end-to-end                                                                                                                                                                                                                                |
| <b>Parameters</b> | <b>high</b> — specifies that the output signaling lead is forced on<br><b>low</b> — specifies that the output signaling lead is forced off<br><b>end-to-end</b> — specifies that the output signaling lead follows that of the remote end |

## m

|                    |                                                                                                                                                                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>m {high   low   end-to-end}</b>                                                                                                                                                                                                              |
| <b>Context</b>     | config>port>voice>em>signaling-lead                                                                                                                                                                                                             |
| <b>Description</b> | <p>This command configures the input signaling lead known as the M-lead (Mouth, Magneto, or Multiplexer).</p> <p>This command is valid only if <a href="#">signaling-mode</a> is configured for E&amp;M signaling.</p>                          |
| <b>Default</b>     | end-to-end                                                                                                                                                                                                                                      |
| <b>Parameters</b>  | <b>high</b> — specifies that the input signaling lead is forced on<br><b>low</b> — specifies that the input signaling lead is forced off<br><b>end-to-end</b> — specifies that the input signaling lead follows that of the connected equipment |

## signaling-mode

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>signaling-mode {em   transmission-only}</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Context</b>     | config>port>voice>em                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b> | <p>This command configures the signaling mode for the specified port or channel. This configuration is done for groups of three ports (ports 1 to 3 and ports 4 to 6). The first port to be configured in the group sets the signaling mode for the other ports in the group. For example, if port 1 is set for transmission only, ports 2 and 3 must also be set for transmission only, and if port 4 is set for E&amp;M signaling, ports 5 and 6 must also be set for E&amp;M signaling. To change the signaling mode of a port, all ports in the group must first be deconfigured.</p> |
| <b>Default</b>     | em                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Parameters</b>  | <b>em</b> — specifies E&M signaling mode<br><b>transmission-only</b> — specifies transmission-only mode. This parameter is not valid if <a href="#">audio-wires</a> is configured for two-wire operation.                                                                                                                                                                                                                                                                                                                                                                                 |

## t1p-rx

|                    |                                                                                                                                                                                                                                                                                                                                                             |               |                                                                                                          |                |                                         |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------|
| <b>Syntax</b>      | <b>t1p-rx</b> <i>decibels</i>                                                                                                                                                                                                                                                                                                                               |               |                                                                                                          |                |                                         |
| <b>Context</b>     | config>port>voice                                                                                                                                                                                                                                                                                                                                           |               |                                                                                                          |                |                                         |
| <b>Description</b> | This command configures the analog-to-digital receive transmission level point (TLP) for the specified port.                                                                                                                                                                                                                                                |               |                                                                                                          |                |                                         |
| <b>Parameters</b>  | <i>decibels</i> — specifies the transmission level point expressed as an integer (in tenths) <table><tr><td><b>Values</b></td><td>–16.0 to +7.0 (for E&amp;M four-wires)<br/>–10.0 to +6.0 (for E&amp;M two-wires)<br/>–7.0 to 0.0 (for FXO and FXS)</td></tr><tr><td><b>Default</b></td><td>0.0 (for E&amp;M)<br/>–3.0 (for FXO and FXS)</td></tr></table> | <b>Values</b> | –16.0 to +7.0 (for E&M four-wires)<br>–10.0 to +6.0 (for E&M two-wires)<br>–7.0 to 0.0 (for FXO and FXS) | <b>Default</b> | 0.0 (for E&M)<br>–3.0 (for FXO and FXS) |
| <b>Values</b>      | –16.0 to +7.0 (for E&M four-wires)<br>–10.0 to +6.0 (for E&M two-wires)<br>–7.0 to 0.0 (for FXO and FXS)                                                                                                                                                                                                                                                    |               |                                                                                                          |                |                                         |
| <b>Default</b>     | 0.0 (for E&M)<br>–3.0 (for FXO and FXS)                                                                                                                                                                                                                                                                                                                     |               |                                                                                                          |                |                                         |

## t1p-tx

|                    |                                                                                                                                                                                                                                                                                                                                                             |               |                                                                                                           |                |                                        |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------------------------------------------------------------------------------------------------|----------------|----------------------------------------|
| <b>Syntax</b>      | <b>t1p-tx</b> <i>decibels</i>                                                                                                                                                                                                                                                                                                                               |               |                                                                                                           |                |                                        |
| <b>Context</b>     | config>port>voice                                                                                                                                                                                                                                                                                                                                           |               |                                                                                                           |                |                                        |
| <b>Description</b> | This command configures the analog-to-digital transmit transmission level point (TLP) for the specified port.                                                                                                                                                                                                                                               |               |                                                                                                           |                |                                        |
| <b>Parameters</b>  | <i>decibels</i> — specifies the transmission level point expressed as an integer (in tenths) <table><tr><td><b>Values</b></td><td>–16.0 to +7.0 (for E&amp;M four-wires)<br/>–10.0 to +6.0 (for E&amp;M two-wires)<br/>–4.0 to +3.0 (for FXO and FXS)</td></tr><tr><td><b>Default</b></td><td>0.0 (for E&amp;M)<br/>0.0 (for FXO and FXS)</td></tr></table> | <b>Values</b> | –16.0 to +7.0 (for E&M four-wires)<br>–10.0 to +6.0 (for E&M two-wires)<br>–4.0 to +3.0 (for FXO and FXS) | <b>Default</b> | 0.0 (for E&M)<br>0.0 (for FXO and FXS) |
| <b>Values</b>      | –16.0 to +7.0 (for E&M four-wires)<br>–10.0 to +6.0 (for E&M two-wires)<br>–4.0 to +3.0 (for FXO and FXS)                                                                                                                                                                                                                                                   |               |                                                                                                           |                |                                        |
| <b>Default</b>     | 0.0 (for E&M)<br>0.0 (for FXO and FXS)                                                                                                                                                                                                                                                                                                                      |               |                                                                                                           |                |                                        |

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### 3.13.2.28 Voice Channel Group Commands

#### channel-group

|                    |                                                                                                                                                                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] channel-group</b> <i>channel-group-id</i>                                                                                                                                                                                          |
| <b>Context</b>     | config>port>voice>em<br>config>port>voice>fxo<br>config>port>voice>fxs                                                                                                                                                                     |
| <b>Description</b> | <p>This command creates a DS0 channel group for a channelized E&amp;M, FXO, or FXS voice interface.</p> <p>Channel groups cannot be further subdivided.</p> <p>The <b>no</b> form of this command deletes the specified channel group.</p> |
| <b>Default</b>     | n/a                                                                                                                                                                                                                                        |
| <b>Parameters</b>  | <i>channel-group-id</i> — specifies the channel group ID number                                                                                                                                                                            |
| <b>Values</b>      | 1 (only a single DS0 channel group, the first one, can be configured)                                                                                                                                                                      |

#### encap-type

|                    |                                                                                                                  |
|--------------------|------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>encap-type cem</b>                                                                                            |
| <b>Context</b>     | config>port>voice>em>channel-group<br>config>port>voice>fxo>channel-group<br>config>port>voice>fxs>channel-group |
| <b>Description</b> | This command configures the encapsulation method used by the channel group.                                      |
| <b>Default</b>     | no encap-type                                                                                                    |
| <b>Parameters</b>  | <b>cem</b> — specifies the encapsulation method as circuit emulation (TDM)                                       |

## mode

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mode access</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | config>port>voice>em>channel-group<br>config>port>voice>fxo>channel-group<br>config>port>voice>fxs>channel-group                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | <p>This command configures a channelized voice interface for access mode operation. Network mode is not supported.</p> <p>An access port or channel is used for customer-facing traffic on which services are configured. A Service Access Point (SAP) can only be configured on an access port or channel.</p> <p>When a port or channel is configured for access mode, the <b>encap-type</b> must be specified (in this case, <b>cem</b>) to distinguish the services on the port.</p> |
| <b>Default</b>     | access                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Parameters</b>  | <b>access</b> — specifies the channelized E&M, FXO, or FXS voice port as service access                                                                                                                                                                                                                                                                                                                                                                                                  |

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### 3.13.2.29 LAG Commands

#### lag

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] lag</b> <i>lag-id</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | <p>This command enables the context in which Link Aggregation Group (LAG) attributes are defined.</p> <p>A LAG groups two or more Ethernet links (ports) into one logical link. The aggregation of multiple physical links adds redundancy and improves resiliency between two network devices, and allows for load sharing.</p> <p>On access ports, a LAG can have a maximum of two links and can support active/standby operation. If an active link in a LAG fails, traffic gets redistributed to the standby link.</p> <p>On network ports, a LAG can have a maximum of eight links (depending on the platform or adapter card/module and the Ethernet port type) and can support active/active and active/standby operation. In active/active mode, the links are used for load sharing.</p> <p>The <b>no</b> form of this command deletes the LAG from the configuration. A LAG can only be deleted while it is administratively shut down. Any dependencies, such as IP interface configurations, must be removed from the LAG before it can be shut down.</p> |
| <b>Default</b>     | no lag                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Parameters</b>  | <i>lag-id</i> — the LAG identifier, expressed as a decimal integer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Values</b>      | 1 to 32                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

#### access

|                    |                                                                  |
|--------------------|------------------------------------------------------------------|
| <b>Syntax</b>      | <b>access</b>                                                    |
| <b>Context</b>     | config>lag                                                       |
| <b>Description</b> | This command enables the context to configure access parameters. |
| <b>Default</b>     | n/a                                                              |

#### adapt-qos

|                |                                      |
|----------------|--------------------------------------|
| <b>Syntax</b>  | <b>adapt-qos {link   distribute}</b> |
| <b>Context</b> | config>lag>access                    |

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|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b> | This command specifies how active/active LAG SAP queue scheduler, SAP scheduler (H-QoS), and SAP MSS scheduler QoS rates (as specified by the SLA) are distributed to each of the active LAG ports. This command applies only to access LAGs.                                                                                                                                                                                                                                                                                                                             |
| <b>Default</b>     | link                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Parameters</b>  | <p><b>link</b> — specifies that the full QoS rates are configured on each of the active LAG links for SAP queue schedulers, SAP schedulers (H-QoS), and SAP MSS schedulers</p> <p><b>distribute</b> — specifies that the QoS rates are divided equally among the active LAG links for SAP queue schedulers, SAP schedulers (H-QoS), and egress MSS schedulers. For ingress MSS shaper schedulers, the <b>distribute</b> parameter specifies that the QoS rates are divided proportionally among the active link MDAs based on the number of active links on each MDA.</p> |

## dynamic-cost

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] dynamic-cost</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | config>lag                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b> | <p>This command enables OSPF or IS-IS costing of a LAG based on the available aggregated, operational bandwidth.</p> <p>The path cost is dynamically calculated based on the interface bandwidth. OSPF path cost can be changed through the interface metric or the reference bandwidth.</p> <p>If dynamic cost is configured, costing is applied based on the total number of links configured and the cost advertised is inversely proportional to the number of links available at the time. This requires that the number of links that are up exceeds the configured LAG threshold value; if the number of links that are up falls below the threshold, the configured threshold action determines whether, and at what cost, this LAG will be advertised (see <a href="#">port-threshold</a>).</p> <p>For example, a physical link in OSPF has a cost associated with it of 100, and the LAG consists of four physical links. The cost associated with the logical link is 25. If one link fails, the cost is automatically adjusted to 33.</p> <p>If dynamic cost is not configured and OSPF auto-cost is configured, costing is applied based on the total number of links configured. This cost will remain static provided that the number of links that are up exceeds the configured LAG threshold value; if the number of links that are up falls below the threshold, the configured threshold action determines whether, and at what cost, this LAG will be advertised.</p> <p>If dynamic cost is configured and OSPF auto-cost is not configured, the cost is determined by the cost configured on the OSPF metric, provided that the number of links that are up exceeds the configured LAG threshold value; if the number of links that are up falls below the threshold, the configured threshold action determines whether this LAG will be advertised.</p> |

If neither dynamic cost nor OSPF auto-cost is configured, the cost advertised is determined by the cost configured on the OSPF metric, provided that the number of links that are up exceeds the configured LAG threshold value; if the number of links that are up falls below the threshold, the configured threshold action determines whether this LAG will be advertised.

The **no** form of this command removes dynamic costing from the LAG.

**Default** no dynamic-cost

## encap-type

**Syntax** **encap-type** {dot1q | null | qinq}  
**no encap-type**

**Context** config>lag

**Description** This command configures the encapsulation method used to distinguish customer traffic on a LAG.

The encapsulation type of a LAG must match that of its member links. If the encapsulation type of the LAG is changed, the encapsulation type of all its member links also changes.

The encapsulation type can be changed on the LAG only if there is no interface or service associated with it. If the MTU is set to a non-default value, it will be reset to the default value when the encapsulation type is changed.

The **no** form of this command reverts to the default encapsulation type.

**Default** null — all traffic on the link belongs to a single service or VLAN

**Parameters** **dot1q** — ingress Ethernet frames carry IEEE 802.1Q tags, each tag signifying a different service

**null** — ingress Ethernet frames do not use any tags to indicate a service. As a result, only one service can be configured on a link with null encapsulation.

**qinq** — ingress frames carry two tags, where the outer tag is the service provider tag and the inner tag is the customer service tag as defined in 802.1ad

## hold-time

**Syntax** **hold-time down** *hold-down-time*  
**no hold-time**

**Context** config>lag

**Description** This command specifies the delay between detecting that a LAG is down (all active ports are down) and reporting it to the upper layer protocols.

When a failure in a LAG is detected, it is immediately advertised to the rest of the system, but subsequent failures are not advertised to upper layers until the **hold-time down** interval has expired.

Specifying a hold time is especially useful in a 1:1 active/standby configuration because the time between detecting that the active link in the LAG is down and the time needed to activate the standby link is very short. The hold time prevents the LAG from being operationally down when switching between the active and standby link.

The **no** form of this command removes any hold time configured.

|                   |                                                                                                     |
|-------------------|-----------------------------------------------------------------------------------------------------|
| <b>Default</b>    | no hold-time                                                                                        |
| <b>Parameters</b> | <i>hold-down-time</i> — specifies, in tenths of seconds, the hold time before a failure is reported |
| <b>Values</b>     | 0 to 2000                                                                                           |

## lacp

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>lacp</b> [ <i>mode</i> ] [ <b>administrative-key</b> <i>admin-key</i> ]<br><b>no lacp</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>lag                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Description</b> | <p>This command specifies the LACP mode of the LAG. By default, the LACP mode is not set.</p> <p>Per the IEEE 802.1AX-2008 (IEEE 802.3ad) standard, the Link Aggregation Control Protocol (LACP) provides a standardized means for exchanging information between network devices using LAGs. LACP operates in two modes: passive and active. At least one partner must operate in active mode. For example, if the mode on the CE end is passive, the LACP mode on the 7705 SAR end must be active.</p> <p>The <b>no</b> form of this command disables LACP.</p> |
| <b>Default</b>     | no lacp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Parameters</b>  | <p><i>mode</i> — specifies the mode in which LACP operates</p> <p><b>Values</b>      <i>passive</i> — starts transmitting LACP packets only after receiving packets<br/>                  <i>active</i> — initiates the transmission of LACP packets</p> <p><i>admin-key</i> — specifies an administrative key value to identify the aggregation group on each port configured to use LACP. This value should be configured only in exceptional cases. If it is not specified, a random key is assigned.</p> <p><b>Values</b>      1 to 65535</p>                 |



---

## lacp-xmit-interval

|                    |                                                                                                                                                                                                  |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>lacp-xmit-interval {slow   fast}</b><br><b>no lacp-xmit-interval</b>                                                                                                                          |
| <b>Context</b>     | config>lag                                                                                                                                                                                       |
| <b>Description</b> | <p>This command specifies the interval signaled to the peer and tells the peer at which rate it should transmit.</p> <p>The <b>no</b> form of this command returns the value to the default.</p> |
| <b>Default</b>     | fast                                                                                                                                                                                             |
| <b>Parameters</b>  | <b>slow</b> — transmits packets every 30 seconds<br><b>fast</b> — transmits packets every second                                                                                                 |

## lacp-xmit-stdby

|                    |                                                                                                                                                                                                                                                                                                                                |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] lacp-xmit-stdby</b>                                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | config>lag                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | <p>This command enables LACP message transmission on the standby link.</p> <p>The <b>no</b> form of this command disables LACP message transmission on the standby link. Disable LACP message transmission on the standby link if the peer does not properly follow the IEEE 802.3ax standard regarding the LACP sync bit.</p> |
| <b>Default</b>     | lacp-xmit-stdby                                                                                                                                                                                                                                                                                                                |

## mac

|                    |                                                                                                                                                                                                                                                                   |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mac <i>ieee-address</i></b><br><b>no mac</b>                                                                                                                                                                                                                   |
| <b>Context</b>     | config>lag                                                                                                                                                                                                                                                        |
| <b>Description</b> | <p>This command assigns a specific MAC address to the LAG.</p> <p>The <b>no</b> form of this command returns the MAC address to the default value.</p>                                                                                                            |
| <b>Default</b>     | a default MAC address is assigned by the system                                                                                                                                                                                                                   |
| <b>Parameters</b>  | <i>ieee-address</i> — specifies the 48-bit MAC address in the form aa:bb:cc:dd:ee:ff or aa-bb-cc-dd-ee-ff where aa, bb, cc, dd, ee, and ff are hexadecimal numbers. Allowed values are any non-broadcast, non-multicast MAC, and non-IEEE reserved MAC addresses. |

## mode

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mode</b> { <b>access</b>   <b>network</b>   <b>hybrid</b> }<br><b>no mode</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | config>lag                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Description</b> | <p>This command configures the LAG for access, network, or hybrid mode operation.</p> <p>An <b>access</b> port is used for customer-facing traffic on which services are configured. A SAP can only be configured on an access port or channel.</p> <p>A <b>network</b> port participates in the service provider transport or infrastructure network when network mode is selected.</p> <p>A <b>hybrid</b> port allows a single port to operate in both access and network modes.</p> <p>The <b>no</b> form of this command restores the default.</p> |
| <b>Default</b>     | network                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Parameters</b>  | <p><b>access</b> — configures the LAG for access mode operation</p> <p><b>network</b> — configures the LAG for network mode operation</p> <p><b>hybrid</b> — configures the LAG for hybrid mode operation</p>                                                                                                                                                                                                                                                                                                                                          |

## port

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>port</b> <i>port-id</i> [ <i>port-id</i> ] [ <b>priority</b> <i>priority</i> ] [ <b>sub-group</b> <i>sub-group-id</i> ]<br><b>no port</b> <i>port-id</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>lag                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Description</b> | <p>This command adds ports (links) to a LAG. Multiple ports can be added in one command as long as the maximum is not exceeded. A LAG can have up to eight links, depending on the platform or adapter card/module and the Ethernet port type.</p> <p>The port configuration of the first port added to the LAG is used to compare to subsequently added ports. All ports must share the same characteristics (MTU, speed, duplex, and so on) as those of the first port; otherwise, they will not be added to the LAG.</p> <p>The <b>priority</b> parameter sets the priority of the port, which is used by LACP. The port with the highest priority is the primary port. If two or more ports share the same priority value, the port with the lowest port ID becomes the primary port.</p> <p>Any configuration changes made to the primary port apply to all member ports of a LAG. For example, port hold-time and MTU settings can be modified directly on the primary port and will be applied to all member ports. Any configuration changes made to non-primary ports are rejected.</p> |



**Note:** All ports in a LAG must have autonegotiation disabled or set to limited mode (recommended setting is **limited**). Autonegotiation can be disabled or set to limited mode using the [autonegotiate](#) command under the **config>port>ethernet** context.

The **no** form of this command removes ports from the LAG.

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | n/a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Parameters</b> | <p><i>port-id</i> — specifies the physical port ID in the <i>slot/mda/port</i> format</p> <p><i>priority</i> — specifies the priority of a port</p> <p><b>Values</b> 1 to 65535</p> <p><i>sub-group-id</i> — identifies a LAG subgroup. Each port in a LAG must be a member of a subgroup. If no subgroup is specified for an access port, the configuration will fail. If no subgroup is specified for a network port, the port is assigned to subgroup 1.</p> <p>Subgroups should only be configured on one side of a LAG, not both. If you configure the 7705 SAR with subgroups to handle active/standby operation, the partner system should not be configured with subgroups. Only having one side perform active/standby selection guarantees a consistent selection and fast convergence. Active/standby selection is signaled through LACP from one side of the LAG to the other.</p> <p><b>Values</b> 1 or 2 (for LAGs on access ports)<br/>1 to 8 (for LAGs on network ports; system-dependent)</p> |

## port-threshold

|                    |                                                                                                                                                                                                                                                                                                |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>port-threshold</b> <i>value</i> [ <b>action</b> { <b>dynamic-cost</b>   <b>down</b> }]<br><b>no port-threshold</b>                                                                                                                                                                          |
| <b>Context</b>     | config>lag                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | <p>This command sets a threshold value and controls the behavior of the LAG if the number of operational links is equal to or below the threshold value.</p> <p>The <b>no</b> form of this command returns the value to the default.</p>                                                       |
| <b>Default</b>     | 0 action down                                                                                                                                                                                                                                                                                  |
| <b>Parameters</b>  | <p><i>value</i> — the number of operational links at or below which the configured action will be invoked for the LAG. When the number of operational links exceeds the port threshold value, any action taken for being below the threshold value will cease.</p> <p><b>Values</b> 0 to 7</p> |

**action dynamic-cost** — specifies that dynamic costing will be activated if the number of operational links is equal to or below the configured threshold value. The LAG will remain operationally up with a cost relative to the number of operational links. The link will only be regarded as operationally down when all links in the LAG are down.

**action down** — specifies that the LAG will be brought operationally down if the number of operational links is equal to or below the configured threshold value. The LAG will only be regarded as up when the number of operational links exceeds the configured threshold value.

## selection-criteria

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>selection-criteria</b> [ <b>best-port</b>   <b>highest-count</b>   <b>highest-weight</b> ] [ <b>slave-to-partner</b> ]<br>[ <b>subgroup-hold-time</b> <i>hold-time</i> ]<br><b>no selection-criteria</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>lag                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b> | <p>This command specifies which criteria is used to select the active subgroup (link) of a LAG. Every time the configuration of a link changes, the selection algorithm is applied.</p> <p>The <b>no</b> form of this command returns the value to the default.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Default</b>     | highest-count                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Parameters</b>  | <p><b>best-port</b> — specifies that all standby ports will have their corresponding transmitters disabled. This parameter is used in static LAG configurations.</p> <p><b>highest-count</b> — specifies the subgroup with the highest number of eligible member links. An eligible member link of a LAG is a member that can potentially become active.</p> <p>A subgroup can have a maximum of one eligible member link.</p> <p><b>highest-weight</b> — specifies the subgroup with the highest aggregate weight</p> <p><b>slave-to-partner</b> — selects, together with the selection criteria, the active subgroup. An eligible member link of a LAG is a member that can potentially become active. This means it is operationally up (not disabled) for use by the remote side. The <b>slave-to-partner</b> parameter can be used to control whether this latter condition is taken into account. The <b>slave-to-partner</b> parameter does not apply to static LAG configurations.</p> <p>It is recommended that this parameter be set.</p> |

*hold-time* — specifies the delay time, in tenths of a second, before switching to a newly selected active subgroup from the existing active subgroup. The timer delay applies only if the existing subgroup remains operationally up. If a value of 0 or no value is specified, the switchover occurs immediately. If a value of **infinite** is specified, no switchover will occur as long as the subgroup remains up; this setting can be overridden with the **tools>perform>force>lag-id** command. LACP must be enabled on the LAG.

**Values**      0 to 2000 | infinite

standby-signaling

|                    |                                                                                                                                                                                                                                           |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>standby-signaling</b> [ <b>lacp</b>   <b>power-off</b> ]<br><b>no standby-signaling</b>                                                                                                                                                |
| <b>Context</b>     | config>lag                                                                                                                                                                                                                                |
| <b>Description</b> | <p>This command specifies how the state of a member port is signaled to the remote side when the status corresponding to this member port has a standby value.</p> <p>The <b>no</b> form of this command turns off standby signaling.</p> |
| <b>Parameters</b>  | <p><b>lacp</b> — specifies that lacp is active</p> <p><b>power-off</b> — specifies that the standby port transmitter is disabled</p>                                                                                                      |

### 3.13.2.30 Frame Relay Commands

#### frame-relay

|                    |                                                                                                                                                                                                                                                                                                                           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>frame-relay</b>                                                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | <pre>config&gt;port&gt;tdm&gt;ds1&gt;channel-group config&gt;port&gt;tdm&gt;ds3 config&gt;port&gt;tdm&gt;e1&gt;channel-group config&gt;port&gt;tdm&gt;e3 config&gt;port&gt;serial&gt;v35&gt;channel-group config&gt;port&gt;serial&gt;x21&gt;channel-group</pre>                                                          |
| <b>Description</b> | <p>This command allows access to the context to configure the frame relay LMI operational parameters for a DS1/E1 channel group, a V.35 or X.21 SDI channel group, a DS-3/E-3 clear channel port, or a channelized DS3.</p> <p>The <b>no</b> form of this command removes the frame relay LMI operational parameters.</p> |

#### lmi-type

|                    |                                                                                                                                                                                                                                                                                                                                                            |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>lmi-type {ansi   itu   none   rev1}</b><br><b>no lmi-type</b>                                                                                                                                                                                                                                                                                           |
| <b>Context</b>     | <pre>config&gt;port&gt;tdm&gt;ds1&gt;channel-group&gt;frame-relay config&gt;port&gt;tdm&gt;ds3&gt;frame-relay config&gt;port&gt;tdm&gt;e1&gt;channel-group&gt;frame-relay config&gt;port&gt;tdm&gt;e3&gt;frame-relay config&gt;port&gt;serial&gt;v35&gt;channel-group&gt;frame-relay config&gt;port&gt;serial&gt;x21&gt;channel-group&gt;frame-relay</pre> |
| <b>Description</b> | <p>This command configures the LMI type for frame relay interfaces. LMIs are sets of enhancements to the basic frame relay specification.</p>                                                                                                                                                                                                              |
| <b>Default</b>     | itu                                                                                                                                                                                                                                                                                                                                                        |
| <b>Parameters</b>  | <p><b>ansi</b> — specifies ANSI T1.617 Annex D</p> <p><b>itu</b> — specifies ITU-T Q933 Annex A</p> <p><b>none</b> — disable frame relay LMI on the port/channel</p> <p><b>rev1</b> — specifies Rev 1 version of ANSI T1.617 Annex D</p>                                                                                                                   |

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mode

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mode</b> { <b>dce</b>   <b>dte</b>   <b>bidir</b> }<br><b>no lmi-type</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | config>port>tdm>ds1>channel-group>frame-relay<br>config>port>tdm>ds3>frame-relay<br>config>port>tdm>e1>channel-group>frame-relay<br>config>port>tdm>e3>frame-relay<br>config>port>serial>v35>channel-group>frame-relay<br>config>port>serial>x21>channel-group>frame-relay                                                                                                                                                                                                                                                         |
| <b>Description</b> | <p>This command sets the frame relay interface to the DCE, DTE, or bidirectional mode of LMI operation. The DTE mode causes the router to send status enquiries over the interface. The DCE mode causes the router to respond to status enquiries. In bidirectional mode, the router performs both DTE and DCE operation over the FR interface. The bidirectional mode applies to the ANSI and ITU LMI types only.</p> <p>This feature is used when two routers are connected back-to-back, running frame relay encapsulation.</p> |
| <b>Default</b>     | dce                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Parameters</b>  | <b>dce</b> — specifies the DCE mode<br><b>dte</b> — specifies the DTE mode<br><b>bidir</b> — the bidirectional mode for LMI types ANSI and ITU                                                                                                                                                                                                                                                                                                                                                                                     |

## n391dte

|                    |                                                                                                                                                                                                                                                                             |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>n391dte</b> <i>intervals</i><br><b>no n391dte</b>                                                                                                                                                                                                                        |
| <b>Context</b>     | config>port>tdm>ds1>channel-group>frame-relay<br>config>port>tdm>ds3>frame-relay<br>config>port>tdm>e1>channel-group>frame-relay<br>config>port>tdm>e3>frame-relay<br>config>port>serial>v35>channel-group>frame-relay<br>config>port>serial>x21>channel-group>frame-relay  |
| <b>Description</b> | <p>This command configures the DTE full status polling interval for the frame relay LMI. The number specifies the frequency at which inquiries expect a full status report.</p> <p>The <b>no</b> form of this command returns the n391dte counter to the default value.</p> |
| <b>Default</b>     | 6                                                                                                                                                                                                                                                                           |

---

**Parameters**    *intervals* — sets the number of exchanges to be done before requesting a full-status report. A value of 1 specifies to receive full-status messages only.

**Values**        1 to 255

## n392dce

**Syntax**        **n392dce** *threshold*  
**no n392dce**

**Context**        config>port>tdm>ds1>channel-group>frame-relay  
 config>port>tdm>ds3>frame-relay  
 config>port>tdm>e1>channel-group>frame-relay  
 config>port>tdm>e3>frame-relay  
 config>port>serial>v35>channel-group>frame-relay  
 config>port>serial>x21>channel-group>frame-relay

**Description**    This command configures the DCE error threshold for the frame relay LMI. The threshold specifies the number of errors needed to bring down a link.

The **no** form of this command returns the n392dce counter to the default value.

**Default**        3

**Parameters**    *threshold* — sets the number of errors that will put the channel in an operationally down state

**Values**        1 to 10

## n392dte

**Syntax**        **n392dte** *threshold*  
**no n392dte**

**Context**        config>port>tdm>ds1>channel-group>frame-relay  
 config>port>tdm>ds3>frame-relay  
 config>port>tdm>e1>channel-group>frame-relay  
 config>port>tdm>e3>frame-relay  
 config>port>serial>v35>channel-group>frame-relay  
 config>port>serial>x21>channel-group>frame-relay

**Description**    This command configures the DTE error threshold for the frame relay LMI. The threshold specifies the number of errors needed to bring down a link.

The **no** form of this command returns the n392dte counter to the default value.

**Default**        3



---

|                   |                                                                                                       |
|-------------------|-------------------------------------------------------------------------------------------------------|
| <b>Parameters</b> | <i>threshold</i> — sets the number of errors that will put the channel in an operationally down state |
| <b>Values</b>     | 1 to 10                                                                                               |

## n393dce

|                    |                                                                                                                                                                                                                                                                            |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>n393dce</b> <i>count</i><br><b>no n393dce</b>                                                                                                                                                                                                                           |
| <b>Context</b>     | config>port>tdm>ds1>channel-group>frame-relay<br>config>port>tdm>ds3>frame-relay<br>config>port>tdm>e1>channel-group>frame-relay<br>config>port>tdm>e3>frame-relay<br>config>port>serial>v35>channel-group>frame-relay<br>config>port>serial>x21>channel-group>frame-relay |
| <b>Description</b> | This command configures the DCE monitored event count for the frame relay LMI.<br><br>The <b>no</b> form of this command returns the n393dce counter to the default value.                                                                                                 |
| <b>Default</b>     | 4                                                                                                                                                                                                                                                                          |
| <b>Parameters</b>  | <i>count</i> — sets the diagnostic window used to verify link integrity on the DCE interface                                                                                                                                                                               |
| <b>Values</b>      | 1 to 10                                                                                                                                                                                                                                                                    |

## n393dte

|                    |                                                                                                                                                                                                                                                                            |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>n393dte</b> <i>count</i><br><b>no n393dte</b>                                                                                                                                                                                                                           |
| <b>Context</b>     | config>port>tdm>ds1>channel-group>frame-relay<br>config>port>tdm>ds3>frame-relay<br>config>port>tdm>e1>channel-group>frame-relay<br>config>port>tdm>e3>frame-relay<br>config>port>serial>v35>channel-group>frame-relay<br>config>port>serial>x21>channel-group>frame-relay |
| <b>Description</b> | This command configures the DTE monitored event count for the frame relay LMI.<br><br>The <b>no</b> form of this command returns the n393dte counter to the default value.                                                                                                 |
| <b>Default</b>     | 4                                                                                                                                                                                                                                                                          |
| <b>Parameters</b>  | <i>count</i> — sets the diagnostic window used to verify link integrity on the DTE interface                                                                                                                                                                               |
| <b>Values</b>      | 1 to 10                                                                                                                                                                                                                                                                    |

## t391dte

|                    |                                                                                                                                                                                                                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>t391dte</b> <i>keepalive</i><br><b>no t391dte</b>                                                                                                                                                                                                                                       |
| <b>Context</b>     | config>port>tdm>ds1>channel-group>frame-relay<br>config>port>tdm>ds3>frame-relay<br>config>port>tdm>e1>channel-group>frame-relay<br>config>port>tdm>e3>frame-relay<br>config>port>serial>v35>channel-group>frame-relay<br>config>port>serial>x21>channel-group>frame-relay                 |
| <b>Description</b> | This command configures the DTE keepalive timer for the frame relay LMI.<br><br>This number specifies the interval at which the DTE sends out a keepalive response request to the DCE.<br><br>The <b>no</b> form of this command returns the t391dte keepalive timer to the default value. |
| <b>Default</b>     | 10                                                                                                                                                                                                                                                                                         |
| <b>Parameters</b>  | <i>keepalive</i> — sets the interval, in seconds, between status inquiries issued by the DTE<br><br><b>Values</b> 5 to 30                                                                                                                                                                  |

## t392dce

|                    |                                                                                                                                                                                                                                                                                      |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>t392dce</b> <i>keepalive</i><br><b>no t392dce</b>                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>port>tdm>ds1>channel-group>frame-relay<br>config>port>tdm>ds3>frame-relay<br>config>port>tdm>e1>channel-group>frame-relay<br>config>port>tdm>e3>frame-relay<br>config>port>serial>v35>channel-group>frame-relay<br>config>port>serial>x21>channel-group>frame-relay           |
| <b>Description</b> | This command configures the DCE keepalive timer for the frame relay LMI.<br><br>This number specifies the interval at which the DCE checks for keepalive responses from the DTE.<br><br>The <b>no</b> form of this command returns the t392dce keepalive timer to the default value. |
| <b>Default</b>     | 15                                                                                                                                                                                                                                                                                   |
| <b>Parameters</b>  | <i>keepalive</i> — sets the expected interval, in seconds, between status inquiries issued by the DTE<br><br><b>Values</b> 5 to 30                                                                                                                                                   |

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### 3.13.2.31 Cisco HDLC Commands

#### cisco-hdlc

|                    |                                                                                                                                                                                                                                                                      |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>cisco-hdlc</b>                                                                                                                                                                                                                                                    |
| <b>Context</b>     | config>port>tdm>ds1>channel-group<br>config>port>tdm>e1>channel-group<br>config>port>serial>v35>channel-group<br>config>port>serial>x21>channel-group                                                                                                                |
| <b>Description</b> | This command enables the context to configure Cisco HDLC parameters. Cisco HDLC is an encapsulation protocol that governs information transfer. The protocol specifies a data encapsulation method on synchronous serial links using frame characters and checksums. |

#### down-count

|                    |                                                                                                                                                                                                                                                                                                                                          |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>down-count</b> <i>down-count</i><br><b>no down-count</b>                                                                                                                                                                                                                                                                              |
| <b>Context</b>     | config>port>tdm>ds1>channel-group>cisco-hdlc<br>config>port>tdm>e1>channel-group>cisco-hdlc<br>config>port>serial>v35>channel-group>cisco-hdlc<br>config>port>serial>x21>channel-group>cisco-hdlc                                                                                                                                        |
| <b>Description</b> | <p>This command configures the number of keepalive intervals that must pass without receiving a keepalive packet before the link is declared down. The nodes at the two endpoints of the cHDLC link must be provisioned with the same values.</p> <p>The <b>no</b> form of this command returns the down-count to the default value.</p> |
| <b>Default</b>     | 3                                                                                                                                                                                                                                                                                                                                        |
| <b>Parameters</b>  | <i>down-count</i> — sets the number of keepalive intervals that must pass without receiving a keepalive packet before the link is declared down                                                                                                                                                                                          |
| <b>Values</b>      | 3 to 16                                                                                                                                                                                                                                                                                                                                  |

## keepalive

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>keepalive</b> <i>time-interval</i><br><b>no keepalive</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | config>port>tdm>ds1>channel-group>cisco-hdlc<br>config>port>tdm>e1>channel-group>cisco-hdlc<br>config>port>serial>v35>channel-group>cisco-hdlc<br>config>port>serial>x21>channel-group>cisco-hdlc                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b> | <p>This command configures the interval, in seconds, used to send periodic keepalive packets. The receiver process expects to receive a keepalive packet every keepalive interval. The link is declared down if the receiver process does not receive a keepalive within the time-out interval. The link is declared up when the number of continual keepalive packets received equals the up-count. The nodes at the two endpoints of the cHDLC link must be provisioned with the same values.</p> <p>The <b>no</b> form of this command returns the keepalive interval to the default value.</p> |
| <b>Default</b>     | 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Parameters</b>  | <p><i>time-interval</i> — sets the interval, in seconds, used to send periodic keepalive packets</p> <p><b>Values</b> 0 to 300. A value of 0 means no keepalive packets are sent.</p>                                                                                                                                                                                                                                                                                                                                                                                                              |

## up-count

|                    |                                                                                                                                                                                                                                                                                                                    |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>up-count</b> <i>up-count</i><br><b>no up-count</b>                                                                                                                                                                                                                                                              |
| <b>Context</b>     | config>port>tdm>ds1>channel-group>cisco-hdlc<br>config>port>tdm>e1>channel-group>cisco-hdlc<br>config>port>serial>v35>channel-group>cisco-hdlc<br>config>port>serial>x21>channel-group>cisco-hdlc                                                                                                                  |
| <b>Description</b> | <p>This command configures the number of continual keepalive packets that have to be received in order to declare the link up. The nodes at the two endpoints of the cHDLC link must be provisioned with the same values.</p> <p>The <b>no</b> form of this command returns the up-count to the default value.</p> |
| <b>Default</b>     | 1                                                                                                                                                                                                                                                                                                                  |
| <b>Parameters</b>  | <p><i>up-count</i> — sets the number of continual keepalive packets that must be received in order to declare the link up</p> <p><b>Values</b> 1 to 3</p>                                                                                                                                                          |

### 3.13.2.32 SCADA Commands

#### scada

|                    |                                                                                                                        |
|--------------------|------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>scada</b> <i>bridge-id</i>                                                                                          |
| <b>Context</b>     | config                                                                                                                 |
| <b>Description</b> | This command configures a SCADA bridge on the Integrated Services card.                                                |
| <b>Parameters</b>  | <i>bridge-id</i> — specifies a SCADA bridge, in the format <i>slot/mda/bridge-id</i> where <i>bridge-id</i> is 1 to 16 |

#### branch

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |               |                                                                                                            |  |                                                                                                                               |  |                                                                                                                                |  |                                                                                                  |  |                                                                                                   |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------------------------------------------------------------------------------------------------------|--|-------------------------------------------------------------------------------------------------------------------------------|--|--------------------------------------------------------------------------------------------------------------------------------|--|--------------------------------------------------------------------------------------------------|--|---------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] branch</b> <i>branch-id</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |               |                                                                                                            |  |                                                                                                                               |  |                                                                                                                                |  |                                                                                                  |  |                                                                                                   |
| <b>Context</b>     | config>scada                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |               |                                                                                                            |  |                                                                                                                               |  |                                                                                                                                |  |                                                                                                  |  |                                                                                                   |
| <b>Description</b> | This command configures a branch that is used by the configured bridge.<br><br>The <b>no</b> form of the command deletes the specified branch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |               |                                                                                                            |  |                                                                                                                               |  |                                                                                                                                |  |                                                                                                  |  |                                                                                                   |
| <b>Parameters</b>  | <i>branch-id</i> — the branch identifier<br><br><table> <tr> <td><b>Values</b></td><td>1 to 32; branches 1 and 2 are dedicated as master branches, and branches 3 to 32 are slave branches (MDDb)</td></tr> <tr> <td></td><td>1 to 30; branches 1 and 2 are dedicated as master branches, and branches 3 to 30 are slave branches (PCM with A-Law encoding)</td></tr> <tr> <td></td><td>1 to 22; branches 1 and 2 are dedicated as master branches, and branches 3 to 22 are slave branches (PCM with Mu-Law encoding)</td></tr> <tr> <td></td><td>1 to 32; in broadcast mode, branch 1 is dedicated as the master branch (VCB with A-Law encoding)</td></tr> <tr> <td></td><td>1 to 24; in broadcast mode, branch 1 is dedicated as the master branch (VCB with Mu-Law encoding)</td></tr> </table> | <b>Values</b> | 1 to 32; branches 1 and 2 are dedicated as master branches, and branches 3 to 32 are slave branches (MDDb) |  | 1 to 30; branches 1 and 2 are dedicated as master branches, and branches 3 to 30 are slave branches (PCM with A-Law encoding) |  | 1 to 22; branches 1 and 2 are dedicated as master branches, and branches 3 to 22 are slave branches (PCM with Mu-Law encoding) |  | 1 to 32; in broadcast mode, branch 1 is dedicated as the master branch (VCB with A-Law encoding) |  | 1 to 24; in broadcast mode, branch 1 is dedicated as the master branch (VCB with Mu-Law encoding) |
| <b>Values</b>      | 1 to 32; branches 1 and 2 are dedicated as master branches, and branches 3 to 32 are slave branches (MDDb)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |               |                                                                                                            |  |                                                                                                                               |  |                                                                                                                                |  |                                                                                                  |  |                                                                                                   |
|                    | 1 to 30; branches 1 and 2 are dedicated as master branches, and branches 3 to 30 are slave branches (PCM with A-Law encoding)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |               |                                                                                                            |  |                                                                                                                               |  |                                                                                                                                |  |                                                                                                  |  |                                                                                                   |
|                    | 1 to 22; branches 1 and 2 are dedicated as master branches, and branches 3 to 22 are slave branches (PCM with Mu-Law encoding)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |               |                                                                                                            |  |                                                                                                                               |  |                                                                                                                                |  |                                                                                                  |  |                                                                                                   |
|                    | 1 to 32; in broadcast mode, branch 1 is dedicated as the master branch (VCB with A-Law encoding)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |                                                                                                            |  |                                                                                                                               |  |                                                                                                                                |  |                                                                                                  |  |                                                                                                   |
|                    | 1 to 24; in broadcast mode, branch 1 is dedicated as the master branch (VCB with Mu-Law encoding)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |               |                                                                                                            |  |                                                                                                                               |  |                                                                                                                                |  |                                                                                                  |  |                                                                                                   |

#### gain

|                    |                                                                   |
|--------------------|-------------------------------------------------------------------|
| <b>Syntax</b>      | <b>gain</b>                                                       |
| <b>Context</b>     | config>scada>branch                                               |
| <b>Description</b> | This command enables the context to set gain levels for a branch. |

## input

|                    |                                                                                                                                                              |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>input</b> <i>decibels</i>                                                                                                                                 |
| <b>Context</b>     | config>scada>branch>gain                                                                                                                                     |
| <b>Description</b> | This command sets the input gain for the branch. The input gain defines the magnitude of the increase or decrease of the signal transmitted into the bridge. |
| <b>Default</b>     | 0                                                                                                                                                            |
| <b>Parameters</b>  | <i>decibels</i> — number of decibels by which the transmitted signal is increased or decreased                                                               |
| <b>Values</b>      | –16 to +9 dB (in 1-dB increments)                                                                                                                            |

## output

|                    |                                                                                                                                                             |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>output</b> <i>decibels</i>                                                                                                                               |
| <b>Context</b>     | config>scada>branch>gain                                                                                                                                    |
| <b>Description</b> | This command sets the output gain for the branch. The output gain defines the magnitude of the increase or decrease of the signal received from the bridge. |
| <b>Default</b>     | 0                                                                                                                                                           |
| <b>Parameters</b>  | <i>decibels</i> — number of decibels by which the received signal is increased or decreased                                                                 |
| <b>Values</b>      | –16 to +9 dB (in 1-dB increments)                                                                                                                           |

## squelch

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] squelch</b>                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Context</b>     | config>scada>branch                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Description</b> | <p>This command administratively enables the squelching function for the branch. The squelching function can only be enabled on a branch if it is enabled at the bridge level (<b>config&gt;scada&gt;mddb&gt;squelch</b> or <b>config&gt;scada&gt;pcm&gt;squelch</b>).</p> <p>The <b>no</b> form of this command administratively disables the squelching function on the branch.</p> <p>The command does not apply to the VCB application.</p> |
| <b>Default</b>     | <p>squelch (slave branches)</p> <p>no squelch (master branches)</p>                                                                                                                                                                                                                                                                                                                                                                             |

## mddb

|                    |                                                                                   |
|--------------------|-----------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mddb</b>                                                                       |
| <b>Context</b>     | config>scada                                                                      |
| <b>Description</b> | This command enables the context to configure Mddb parameters for a SCADA bridge. |

## pcm

|                    |                                                                                                   |
|--------------------|---------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>pcm</b>                                                                                        |
| <b>Context</b>     | config>scada                                                                                      |
| <b>Description</b> | This command enables the context to configure PCM multidrop bridge parameters for a SCADA bridge. |

## force-active

|                    |                                                                                                                                |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>force-active master</b> <i>branch-id</i>                                                                                    |
| <b>Context</b>     | config>scada>mddb<br>config>scada>pcm                                                                                          |
| <b>Description</b> | This command forces a master branch to become active. The command applies only if <b>redundant-mode</b> is set to manual mode. |
| <b>Default</b>     | 1                                                                                                                              |
| <b>Parameters</b>  | <i>branch-id</i> — the master branch that is forced to become active<br><b>Values</b> 1 or 2                                   |

## redundant-mode

|                    |                                                                                                                                                                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>redundant-mode</b> <i>redundant-mode</i>                                                                                                                                                                                                                                                              |
| <b>Context</b>     | config>scada>mddb<br>config>scada>pcm                                                                                                                                                                                                                                                                    |
| <b>Description</b> | <p>This command configures the redundancy mode for the master inputs of the SCADA bridge.</p> <p>In manual mode, the branch must be made active manually using the <b>force-active</b> command in order to receive data from the master input. The bridge always broadcasts to both master branches.</p> |

In auto mode, both the master branch inputs are received simultaneously. This requires the master input behavior to be similar to an RTU, which transmits data when active and transmits either all 1s (MDDb) or no data (PCM) when inactive.

|                   |                                                                                                 |
|-------------------|-------------------------------------------------------------------------------------------------|
| <b>Default</b>    | manual                                                                                          |
| <b>Parameters</b> | <i>redundant-mode</i> — specifies the redundancy mode for the master inputs of the SCADA bridge |
| <b>Values</b>     | manual   auto                                                                                   |

## report-alarm

|                    |                                                                                                                      |
|--------------------|----------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] report-alarm [hcmOof] [hcmRai]</b>                                                                           |
| <b>Context</b>     | config>scada>mddb                                                                                                    |
| <b>Description</b> | This command enables the logging of alarms.<br><br>The <b>no</b> form of the command disables the logging of alarms. |
| <b>Default</b>     | no report-alarm                                                                                                      |
| <b>Parameters</b>  | <b>hcmOof</b> — specifies HCM out-of-frame errors<br><b>hcmRai</b> — specifies HCM remote alarm indications          |

## speed

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>speed {600   1200   2400   4800   9600   19200   38400   56000}</b>                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>scada>mddb                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | This command configures the SCADA MDDb speed for RS-232 and X.21 interfaces. SCADA MDDb is supported only at subrate speeds (less than 64kb/s) on X.21 interfaces.                                                                                                                                                                                                                                                                                             |
| <b>Default</b>     | 2400                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Parameters</b>  | <b>600</b> — sets the SCADA MDDb speed at 600 (supported on RS-232 interfaces only)<br><b>1200</b> — sets the SCADA MDDb speed at 1200<br><b>2400</b> — sets the SCADA MDDb speed at 2400<br><b>4800</b> — sets the SCADA MDDb speed at 4800<br><b>9600</b> — sets the SCADA MDDb speed at 9600<br><b>19200</b> — sets the SCADA MDDb speed at 19200<br><b>38400</b> — sets the SCADA MDDb speed at 38400<br><b>56000</b> — sets the SCADA MDDb speed at 56000 |



## squelch

|                    |                                                                                                                                                                                                                                                                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>squelch timeout</b> <i>timeout</i><br><b>squelch reset</b><br><b>no squelch</b>                                                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>scada>mddb<br>config>scada>pcm                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b> | <p>This command enables the squelching function for all branches configured on a bridge. This setting takes priority over the setting at the branch level; that is, if squelch is disabled with this command, it cannot be enabled for individual branches.</p> <p>The <b>no</b> form of this command disables the squelching function on a bridge.</p> |
| <b>Default</b>     | no squelch                                                                                                                                                                                                                                                                                                                                              |
| <b>Parameters</b>  | <p><i>timeout</i> — the interval between when an alarm is raised indicating that a branch has locked up and is continuing to send data to the master, and squelching is triggered</p> <p><b>Values</b> 1 to 120 s</p> <p><b>reset</b> — puts the bridge back into the normal state</p>                                                                  |

## squelch-recovery

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>squelch-recovery</b> [ <i>mode</i> ] [ <b>time</b> <i>time</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Context</b>     | config>scada>mddb<br>config>scada>pcm                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | <p>This command configures squelch recovery attributes. When the <b>squelch-recovery</b> mode is configured as auto, the branch will automatically be put back into the normal state after the configured time. If the branch remains locked up, the branch will automatically be squelched again.</p> <p>Configuring the <b>squelch-recovery</b> mode as manual disables automatic squelch recovery. To put the bridge back into the normal state, use the <b>squelch reset</b> command.</p> |
| <b>Default</b>     | squelch-recovery manual                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Parameters</b>  | <p><i>mode</i> — specifies the squelch recovery mode</p> <p><b>Values</b> manual   auto</p> <p><i>time</i> — the interval after which the branch will automatically be put back into the normal state</p> <p><b>Values</b> 1 to 120 s</p>                                                                                                                                                                                                                                                     |

## vcb

|                    |                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>vcb</b>                                                                                           |
| <b>Context</b>     | config>scada                                                                                         |
| <b>Description</b> | This command enables the context to configure voice conference bridge parameters for a SCADA bridge. |

## idle-code

|                    |                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>idle-code</b> <i>abcd-code</i><br><b>no idle-code</b>                                                                                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>scada>vcb                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | <p>This command defines the ABCD signaling code to be transmitted when the E&amp;M interface is configured to transmit idle fault signaling (see <a href="#">fault-signaling</a>).</p> <p>The <b>no</b> form of the command reverts to the default value.</p> <p>This command is supported only when VCB is operating in <b>vcb-branch-initiate</b> mode.</p> |
| <b>Default</b>     | <p>0 (for Mu-Law companding)</p> <p>13 (for A-Law companding)</p>                                                                                                                                                                                                                                                                                             |
| <b>Parameters</b>  | <p><i>abcd-code</i> — the 4-bit ABCD value to be transmitted</p> <p><b>Values</b>     0 to 15 (can be entered in decimal, binary, or hexadecimal format)</p>                                                                                                                                                                                                  |

## seized-code

|                    |                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>seized-code</b> <i>abcd-code</i><br><b>no seized-code</b>                                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | config>scada>vcb                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | <p>This command defines the ABCD signaling code to be transmitted when the E&amp;M interface is configured to transmit seized fault signaling (see <a href="#">fault-signaling</a>).</p> <p>The <b>no</b> form of the command reverts to the default value.</p> <p>This command is supported only when VCB is operating in <b>vcb-branch-initiate</b> mode.</p> |
| <b>Default</b>     | <p>0 (for Mu-Law companding)</p> <p>13 (for A-Law companding)</p>                                                                                                                                                                                                                                                                                               |

---

|                   |                                                                    |
|-------------------|--------------------------------------------------------------------|
| <b>Parameters</b> | <i>abcd-code</i> — the 4-bit ABCD value to be transmitted          |
| <b>Values</b>     | 0 to 15 (can be entered in decimal, binary, or hexadecimal format) |



## **3.14 Show, Monitor, Clear, and Debug Command Reference**

### **3.14.1 Command Hierarchies**

- [Show Commands](#)
- [Monitor Commands](#)
- [Clear Commands](#)
- [Debug Commands](#)

### 3.14.1.1 Show Commands

#### show

- **aps** [*aps-id*] [detail]
- **card** [*slot-number*] [detail]
- **card state**
- **mda** [*slot* [*/mda*]] [detail]
- **mda** [*slot*/*mda*] **statistics** [source-mds | dest-mds | ip-transport | mirror | security [encryption | firewall]]
- **mda aggregate-statistics** [mirror]
- **mda with-fabric-stats**
- **mda** [*slot* [*/mda*]] **ring mda**
  - **fdb** [mac *ieee-address*] [port *port-id*] [all]
- **external-alarms alarm** [*alarm-id*]
- **external-alarms input** [*alarm-input*] [detail]
- **external-alarms name** [*name-string*] [detail]
- **external-alarms output** [*alarm-output*] [detail]
- **mw link** [*mw-link-id*] [detail]
- **mw radio** [*port-id*] [detail] [power]
- **mw radio software**
- **lag** [*lag-id*] [detail] [statistics]
- **lag** *lag-id* **associations**
- **lag** [*lag-id*] **description**
- **lag** *lag-id* [detail] **lACP-partner**
- **lag** [*lag-id*] **port**
- **multilink-bundle** [*bundle-id* | *slot*/*mda*] **type** {mlppp | ima-grp} [detail]
- **multilink-bundle** [*bundle-id* | *slot*/*mda*] [ppp [multiclass] | ima]
- **multilink-bundle** *bundle-id*
  - ima
    - atm [detail]
      - connections
      - pvc [*vpi/vci*] [detail]
      - pvp [*vp*] [detail]
- **port** *port-id* [statistics] [detail]
- **port** *port-id* **ACR** [detail]
- **port** *port-id* **cisco-hdlc**
- **port** *port-id* **dsl** [detail]
  - **dsl** [efm-oam | line-num]
- **port** *port-id* **description**
- **port** *port-id* **dot1x** [detail]
- **port** *port-id* **associations**
- **port** *port-id* **ppp** [detail]
- **port** *port-id* **ethernet** [efm-oam | detail]
  - **lldp** [nearest-bridge | nearest-non-tpmr | nearest-customer] [remote-info] [detail]
- **port** *port-id* **frame-relay** [detail | dlc] [*dlci*]
- **port** *port-id* **ima-link**
- **port** *port-id* **atm**
- **port** *port-id* **atm connections**
- **port** *port-id* **atm pvc** [*vpi/vci*] [detail]
- **port** *port-id* **atm pvp** [*vp*] [detail]
- **port-tree** *port-id*
- **scada** [*bridge-id*] [detail]
- **scada** [*bridge-id*] **description**

- 
- **scada** [*bridge-id*] [*detail*] **statistics**

### 3.14.1.2 Monitor Commands

#### monitor

- **port** *port-id* [*port-id...*(up to 5 total)] [*interval seconds*] [*repeat repeat*] [*absolute* | *rate*] [*multiclass*]
- **port** *port-id* **atm** [*interval seconds*] [*repeat repeat*] [*absolute* | *rate*]
- **fabric-profile** **mda** {*mda-id* | **with-stats-enabled**} {*dest-mda* | *source-mda*} [*interval seconds*] [*repeat repeat*] [*absolute* | *rate*]
- **scada** *scada-id* [*scada-id...*(up to 5 total)] [*interval seconds*] [*repeat repeat*] [*absolute* | *rate*]

### 3.14.1.3 Clear Commands

#### clear

- **external-alarms** **alarm** [*all* | *alarm-id*]
- **lag** *lag-id* **statistics**
- **mda** *mda-id*
- **mda** *mda-id* **statistics** {*source-mda* | *destination-mda* | *fabric-port* | *fabric-global* | *all*}
- **mda** *mda-id* **statistics** **ip-transport**
- **mda** *mda-id* **statistics** **security** [*encryption* | *firewall*]
- **mda** *mda-id* **statistics** **mirror**
- **mda** *mda-id* **ring** {*all* | *mac ieee-address* | *port port-id*}
- **mda** *all*
- **mw**
  - **link** *mw-link-id* **statistics**
  - **radio** *port-id*
  - **rsl-history** *port-id*
- **port** *port-id* **statistics**
- **port** *port-id* **atm** **pvc** [*vpi* | *vc*] **statistics**
- **port** *port-id* **atm** **pvp** [*vpi*] **statistics**
- **port** *port-id* **frame-relay** **dldci** *dldci*
- **scada** *bridge-id* **statistics**

### 3.14.1.4 Debug Commands

#### debug

- **lag** [*lag-id lag-id*] [*port port-id*] [*all*]
- **lag** [*lag-id lag-id*] [*port port-id*] [*sm*] [*pkt*] [*cfg*] [*red*] [*iom-upd*] [*port-state*] [*timers*] [*sel-logic*] [*mc*] [*mc-pkt*]
- **no lag** [*lag-id lag-id*]

---

## 3.14.2 Command Descriptions

- [Show Commands](#)
- [Monitor Commands](#)
- [Clear Commands](#)
- [Debug Commands](#)



### 3.14.2.1 Show Commands

- [Show APS Commands](#)
- [Show Card Commands](#)
- [Show External Alarms Commands](#)
- [Show Microwave Link Commands](#)
- [Show Port Commands](#)
- [Show ATM Port Commands](#)
- [Show Port-tree Commands](#)
- [Show LAG Commands](#)
- [Show Multilink Bundle and IMA Group Commands](#)
- [Show ATM IMA Group Commands](#)
- [Show SCADA Commands](#)



**Note:** The following command outputs are examples only; actual displays may differ depending on supported functionality and user configuration.

### 3.14.2.1.1 Show APS Commands

#### aps

|                    |                                                                                                                                                                   |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>aps</b> [ <i>aps-id</i> ] [ <i>detail</i> ]                                                                                                                    |
| <b>Context</b>     | show                                                                                                                                                              |
| <b>Description</b> | This command displays Automatic Protection Switching (APS) information.                                                                                           |
| <b>Parameters</b>  | <p><i>aps-id</i> — displays information for the specified APS group ID</p> <p><b>Values</b> 1 to 128</p> <p><b>detail</b> — displays detailed APS information</p> |
| <b>Output</b>      | The following outputs are examples of APS information, and <a href="#">Table 31</a> describes the fields.                                                         |

#### Output Example

```
*A:7705:Dut-A>config>port# show aps
=====
APS Group Info
=====
Interface Admin Oper MC-Ctl Work Prot Active Tx/Rx
 State State State Circuit Circuit Circuit K1 Byte

aps-1 Up Up N/A 1/5/1 1/6/1 1/5/1 PC-Tx: No-Req
=====

*A:7705:Dut-A>config>port# show aps detail
=====
APS Group: aps-1
=====
Description : APS Group
Group Id : 1 Active Circuit : 1/5/1
Admin Status : Up Oper Status : Up
Working Circuit : 1/5/1 Protection Circuit : 1/6/1
Switching-mode : Bi-directional Switching-arch : 1+1(sig,data)
Revertive-mode : Non-revertive Revert-time (min) :
Rx K1/K2 byte : 0x00/0x05 (No-Req on Protect)
Tx K1/K2 byte : 0x00/0x05 (No-Req on Protect)
Current APS Status : OK
Multi-Chassis APS : No
Neighbor : 0.0.0.0
Control link state : N/A
Mode mismatch Cnt : 0 Channel mismatch Cnt : 0
PSB failure Cnt : 1 FEPL failure Cnt : 1

APS Working Circuit - 1/5/1

Admin Status : Up Oper Status : Up
Current APS Status : OK No. of Switchovers : 0
Last Switchover : None Switchover seconds : 0
```

```

Signal Degrade Cnt : 1
Last Switch Cmd : No Cmd
Tx L-AIS : None
Signal Failure Cnt : 0
Last Exercise Result : Unknown

APS Protection Circuit - 1/6/1

Admin Status : Up
Current APS Status : OK
Last Switchover : None
Signal Degrade Cnt : 1
Last Switch Cmd : No Cmd
Tx L-AIS : None
Oper Status : Up
No. of Switchovers : 0
Switchover seconds : 0
Signal Failure Cnt : 0
Last Exercise Result : Unknown
=====

```

**Table 31 Show APS Output Fields**

| Label          | Description                                                                                   |
|----------------|-----------------------------------------------------------------------------------------------|
| Interface      | Specifies the APS interface name (the APS group port)                                         |
| Admin State    | Specifies whether the APS interface is administratively up or down                            |
| Oper State     | Specifies whether the APS interface is operationally up or down                               |
| MC-Ctl state   | Specifies the multi-chassis state                                                             |
| Work Circuit   | Specifies the physical port that is acting as the working circuit for this APS group          |
| Prot Circuit   | Specifies the physical port that is acting as the protection circuit for this APS group       |
| Active Circuit | Specifies the active circuit                                                                  |
| Tx/Rx K1 Byte  | Displays the value of the SONET/SDH K1 byte received or transmitted on the protection circuit |
| APS Group      | Displays the APS group name                                                                   |
| Description    | Displays the APS group description                                                            |
| Group ID       | Displays the APS group ID number                                                              |
| Active Circuit | Specifies the physical port that is acting as the active circuit for this APS group           |
| Admin Status   | Specifies whether the APS circuit is administratively up or down                              |
| Oper Status    | Specifies whether the APS circuit is operationally up or down                                 |

**Table 31 Show APS Output Fields (Continued)**

| Label                | Description                                                                                                                                                                                                                                                                                      |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Working Circuit      | Displays the physical port that is acting as the working circuit for this APS group                                                                                                                                                                                                              |
| Protection Circuit   | Displays the physical port that is acting as the protection circuit for this APS group                                                                                                                                                                                                           |
| Switching-mode       | Displays the switching mode of the APS group                                                                                                                                                                                                                                                     |
| Switching-arch       | Displays the architecture of the APS group                                                                                                                                                                                                                                                       |
| Revertive-mode       | Displays the revertive mode of the APS group:<br>non-revertive — traffic remains on the protection line until another switch request is received<br>revertive — when the condition that caused a switch to the protection line has been cleared, the signal is switched back to the working line |
| Revert-time          | Displays the configured time, in minutes, to wait after the working circuit has become functional again before making the working circuit active again. If the revertive mode is non-revertive, then this field is empty.                                                                        |
| Rx K1/K2 byte        | Displays the value of the SONET/SDH K1/K2 byte received on the interface                                                                                                                                                                                                                         |
| Tx K1/K2 byte        | Displays the value of the SONET/SDH K1/K2 byte transmitted on the interface                                                                                                                                                                                                                      |
| Current APS Status   | Displays the current APS status                                                                                                                                                                                                                                                                  |
| Multi-Chassis APS    | Indicates whether MC-APS is configured                                                                                                                                                                                                                                                           |
| Neighbor             | Displays the neighbor IP address. All zeros indicates the APS group is an SC-APS.                                                                                                                                                                                                                |
| Control link state   | Displays the current control link status                                                                                                                                                                                                                                                         |
| Mode mismatch Cnt    | Indicates the number of times a conflict occurs between the current local mode and the received K2 mode information                                                                                                                                                                              |
| Channel mismatch Cnt | Indicates the number of mismatches between the transmitted K1 channel and the received K2 channel that have been detected                                                                                                                                                                        |

**Table 31 Show APS Output Fields (Continued)**

| Label                | Description                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PSB failure Cnt      | Displays a count of Protection Switch Byte (PSB) failure conditions. This condition occurs when either an inconsistent APS byte or an invalid code is detected.                                                                                                                                                                                                                                                    |
| FEPL failure Cnt     | Displays a count of far-end protection-line (FEPL) failure conditions. This condition is declared based on receiving SF on the protection line in the K1 byte.                                                                                                                                                                                                                                                     |
| No. of Switchovers   | Displays the number of times a switchover has occurred                                                                                                                                                                                                                                                                                                                                                             |
| Last Switchover      | Displays the timestamp of the last switchover                                                                                                                                                                                                                                                                                                                                                                      |
| Switchover seconds   | Displays the cumulative Protection Switching Duration (PSD) time in seconds<br>For a working channel, this is the cumulative number of seconds that service was carried on the protection line<br>For the protection line, this is the cumulative number of seconds that the protection line has been used to carry any working channel traffic. This information is only valid if revertive switching is enabled. |
| Signal Degrade Cnt   | Displays the number of times the signal was degraded                                                                                                                                                                                                                                                                                                                                                               |
| Signal Failure Cnt   | Displays the number of times the signal failed                                                                                                                                                                                                                                                                                                                                                                     |
| Last Switch Cmd      | Reports the last switch command that was performed on a circuit                                                                                                                                                                                                                                                                                                                                                    |
| Last Exercise Result | Displays the result of the last exercise request on a circuit                                                                                                                                                                                                                                                                                                                                                      |
| Advertise Interval   | Displays the advertise interval                                                                                                                                                                                                                                                                                                                                                                                    |
| Hold time            | Displays the hold time                                                                                                                                                                                                                                                                                                                                                                                             |

3.14.2.1.2 Show Card Commands

card

|             |                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Syntax      | <b>card</b> [ <i>slot-number</i> ] [ <b>detail</b> ]<br><b>card state</b>                                                                                                                                                                                                                                                                                                                                       |
| Context     | show                                                                                                                                                                                                                                                                                                                                                                                                            |
| Description | This command displays IOM and CSM information for the chassis.                                                                                                                                                                                                                                                                                                                                                  |
| Default     | displays summary information only                                                                                                                                                                                                                                                                                                                                                                               |
| Parameters  | <i>slot-number</i> — displays information for the specified card slot (always 1)<br><b>Values</b> 1<br><b>state</b> — displays provisioned and equipped card, adapter card, and module information<br><b>detail</b> — displays detailed IOM information if used with the <b>card</b> <i>slot-number</i> option and displays detailed IOM and CSM card information if used without the <i>slot-number</i> option |
| Output      | The following outputs are examples of card information: <ul style="list-style-type: none"><li>• Card (<a href="#">Output Example, Table 32</a>)</li><li>• Card State (<a href="#">Output Example, Table 33</a>)</li><li>• Card Detailed (<a href="#">Output Example, Table 34</a>)</li><li>• CSM Card (<a href="#">Output Example, Table 35</a>)</li></ul>                                                      |

Output Example

```
ALU-1# show card
=====
Card Summary
=====
Slot Provisioned Type Admin Operational Comments
 Equipped Type (if different) State State

1 iom-sar up up
A csmv2-10g up up/active
B csmv2-10g up down/standby
=====
```

**Table 32 Show Card Output Fields**

| Label                        | Description                                                                                                                                                                            |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Slot                         | The slot number of the card in the chassis                                                                                                                                             |
| Provisioned Type             | The card type that is configured for the slot                                                                                                                                          |
| Equipped Type (if different) | The card type that is actually populated in the slot if different from the provisioned type                                                                                            |
| Admin State                  | up: the card is administratively up<br>down: the card is administratively down                                                                                                         |
| Operational State            | up: the card is operationally up<br>down: the card is operationally down<br>active: the CSM is in active mode (for redundancy)<br>standby: the CSM is in standby mode (for redundancy) |
| Comments                     | Provides other information about the card                                                                                                                                              |

**Output Example**

The following examples display the card states for a 7705 SAR-8, 7705 SAR-18, 7705 SAR-M, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-W, 7705 SAR-Wx, and 7705 SAR-X.

**Note:**

- The **show card state** command output for the 7705 SAR-Hc, 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-W, 7705 SAR-Wx, and 7705 SAR-X will always appear as shown because these platforms have a fixed physical configuration.
- The **show card state** command output for the 7705 SAR-M (all variants) will always appear as shown, with the exception of slot 1/3, where the provisioned type depends on the module installed in those variants with module slots.
- The **show card state** command output for the 7705 SAR-H will always appear as shown, with the exception of slots 1/2 and 1/3, where the provisioned type depends on the module installed in those slots.

For the 7705 SAR-8:

The following example displays card state information for the 7705 SAR-8 with a CSMv2.

```
*A:ALU-1># show card state
=====
Card State
=====
```

| Slot/<br>Id | Provisioned Type<br>Equipped Type (if different) | Admin<br>State | Operational<br>State | Num<br>Ports | Num<br>MDA | Comments |
|-------------|--------------------------------------------------|----------------|----------------------|--------------|------------|----------|
| 1           | iom-sar                                          | up             | up                   |              | 6          |          |
| 1/1         | a12-sdiv2                                        | up             | provisioned          | 12           |            |          |
| 1/2         | a4-oc3                                           | up             | provisioned          | 4            |            |          |
| 1/3         | a16-chds1                                        | up             | provisioned          | 16           |            |          |
| 1/4         | a4-chds3                                         | up             | provisioned          | 4            |            |          |
| 1/5         | a8-eth                                           | up             | provisioned          | 8            |            |          |
| 1/6         | a2-choc3                                         | up             | provisioned          | 2            |            |          |
| A           | csmv2-10g                                        | up             | up                   |              |            | Active   |
| B           | csmv2-10g                                        | up             | down                 |              |            | Standby  |

```
=====
```

For the 7705 SAR-18:

```
*A:ALU-1># show card state
=====
Card State
=====
```

| Slot/<br>Id | Provisioned Type<br>Equipped Type (if different) | Admin<br>State | Operational<br>State | Num<br>Ports | Num<br>MDA | Comments |
|-------------|--------------------------------------------------|----------------|----------------------|--------------|------------|----------|
| 1           | iom-sar                                          | up             | up                   |              | 12         |          |
| 1/1         | aux-alarm                                        | up             | up                   |              |            |          |
| 1/2         | a8-ethv2                                         | up             | up                   |              |            |          |
| 1/3         | a8-ethv2                                         | up             | up                   | 8            |            |          |
| 1/4         | a8-ethv2                                         | up             | provisioned          | 8            |            |          |
| 1/5         | a8-ethv2                                         | up             | provisioned          | 8            |            |          |
| 1/6         | a32-chds1v2                                      | up             | up                   | 32           |            |          |
| 1/7         | a32-chds1v2                                      | up             | up                   | 32           |            |          |
| 1/8         | a32-chds1v2                                      | up             | provisioned          | 8            |            |          |
| 1/9         | a32-chds1v2                                      | up             | provisioned          | 8            |            |          |
| 1/10        | a4-oc3                                           | up             | provisioned          | 4            |            |          |
| 1/11        | a4-chds3                                         | up             | provisioned          | 4            |            |          |
| 1/12        | a2-choc3                                         | up             | provisioned          | 2            |            |          |
| 1/X1        | x-10GigE                                         | up             | provisioned          | 1            |            |          |
| 1/X2        | x-10GigE                                         | up             | provisioned          | 10           |            |          |
| 1/X3        | x-10GigE                                         | up             | provisioned          | 1            |            |          |
| 1/X4        | x-10GigE                                         | up             | provisioned          | 10           |            |          |
| A           | csm-10g                                          | up             | up                   |              |            | Active   |
| B           | csm-10g                                          | up             | down                 |              |            | Standby  |

```
=====
*A:ALU-1>#
```



## For the 7705 SAR-M:

```
*A:ALU-1># show card state
=====
Card State
=====
Slot/ Provisioned Type Admin Operational Num Num Comments
Id Equipped Type (if different) State State Ports MDA

1 iom-sar up up 3
1/1 i7-1gb up up 7
1/2 i16-chds1 up up 16
1/3 p1-GPON up up
A csm-2.5g up up Active
=====
*A:ALU-1>#
```

## For the 7705 SAR-H:

```
*A:ALU-1># show card state
=====
Card State
=====
Slot/ Provisioned Type Admin Operational Num Num Comments
Id Equipped Type (if different) State State Ports MDA

1 iom-sar up up 3
1/1 i8-1gb up up 8
1/2 p4-combo up up 4
1/3 p4-combo up up 4
A csm-2.5g csm-2.5g up up Active
=====
*A:ALU-1>#
```

## For the 7705 SAR-Hc:

```
*A:ALU-1># show card state
=====
Card State
=====
Slot/ Provisioned Type Admin Operational Num Num Comments
Id Equipped Type (if different) State State Ports MDA

1 iom-sar up up 2
1/1 i6-1gb up up 6
1/2 i2-sdi up up 2
A csm-2.5g up up Active
=====
*A:ALU-1>#
```

## For the 7705 SAR-A:

```
*A:ALU-1># show card state
=====
Card State
=====
Slot/ Provisioned Type Admin Operational Num Num Comments
Id Equipped Type (if different) State State Ports MDA

1 iom-sar up up 2
1/1 i12-eth-xor up up 12
1/2 i8-chdsl up up 8
A csm-2.5g up up Active
=====
*A:ALU-1>#
```

## For the 7705 SAR-Ax:

```
*A:sar-Ax# show card state
=====
Card State
=====
Slot/ Provisioned Type Admin Operational Num Num Comments
Id Equipped Type (if different) State State Ports MDA

1 iom-sar up up 2
1/1 i12-1gb-xor up up 12
1/2 i1-gnss up up 1
A csm-2.5g up up Active
=====
```

## For the 7705 SAR-W:

```
*A:ALU-1># show card state
=====
Card State
=====
Slot/ Provisioned Type Admin Operational Num Num Comments
Id Equipped Type (if different) State State Ports MDA

1 iom-sar up up 1
1/1 i5-1gb up up 6
A csm-2.5g up up Active
=====
*A:ALU-1>#
```

## For the 7705 SAR-Wx:

```
*A:ALU-1># show card state
=====
Card State
=====
Slot/ Provisioned Type Admin Operational Num Num Comments
Id Equipped Type (if different) State State Ports MDA

1 iom-sar up up 1
1/1 i5-1gb-b up up 5
A csm-2.5g up up Active
=====
```

For the 7705 SAR-X:

```
*A:ALU-1># show card state
=====
Card State
=====
Slot/ Provisioned Type Admin Operational Num Num Comments
Id Equipped Type (if different) State State Ports MDA

1 iom-sar up up 3
1/1 i8-chdsl-x up up 8
1/2 i7-mix-eth up up 7
1/3 i7-mix-eth up up 7
A csm-2.5g up up Active
=====
*A:ALU-1>#
```

**Table 33** Show Card State Output Fields

| Label                        | Description                                                                                                                                                                                                |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Slot/Id                      | The slot number of the card in the chassis                                                                                                                                                                 |
| Provisioned Type             | The card type that is configured for the slot                                                                                                                                                              |
| Equipped Type (if different) | The card type that is actually populated in the slot if different from the provisioned type                                                                                                                |
| Admin State                  | up: the card is administratively up<br>down: the card is administratively down                                                                                                                             |
| Operational State            | up: the card is operationally up<br>down: the card is operationally down<br>provisioned: there is no card in the slot but it has been preconfigured<br>failed: the installed card has operationally failed |
| Num Ports                    | The number of ports available on the provisioned card                                                                                                                                                      |
| Num MDA                      | The number of adapter cards installed                                                                                                                                                                      |
| Comments                     | Indicates which CSM is the active card and which is in standby mode (for redundancy)                                                                                                                       |

### Output Example

The following example displays detailed card (IOM) information for the 7705 SAR-8.

```
*A:ALU-1># show card 1 detail
=====
Card 1
=====
Slot Provisioned Type Admin Operational Comments
 Equipped Type (if different) State State

1 iom-sar up up

IOM Card Specific Data
 Clock source : none
 Named Pool Mode : Disabled
 Available MDA slots : 6
 Installed MDAs : 2

Hardware Data
 Part number : Sim Part#
 CLEI code : Sim CLEI
 Serial number : card-1
 Manufacture date : 01012003
 Manufacturing string : Sim MfgString card-1
 Manufacturing deviations : Sim MfgDeviation card-1
 Administrative state : up
 Operational state : up
 Temperature : 36C
 Temperature threshold : 75C
 Software boot (rom) version : simulated
 Software version : TiMOS-B-8.0.I1070 both/i386 NOKIA SAR 7705 *
 Time of last boot : 2016/08/05 20:57:10
 Current alarm state : alarm cleared
 Base MAC address : a4:58:01:00:00:00
 Last bootup reason : hard boot
 Memory capacity : 2,031 MB
=====
```

**Table 34**      **Show Card (IOM) Detailed Output Fields**

| Label                        | Description                                                                                 |
|------------------------------|---------------------------------------------------------------------------------------------|
| Slot                         | The slot number of the IOM (always 1)                                                       |
| Provisioned Type             | The card type that is configured for the slot (iom-sar)                                     |
| Equipped Type (if different) | The card type that is actually populated in the slot if different from the provisioned type |
| Admin State                  | up: the card is administratively up<br>down: the card is administratively down              |
| Operational State            | up: the card is operationally up<br>down: the card is operationally down                    |
| Comments                     | Provides other information about the card                                                   |

**Table 34 Show Card (IOM) Detailed Output Fields (Continued)**

| Label                       | Description                                                                                                                                                                                                  |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Clock source                | The system's clock source                                                                                                                                                                                    |
| Available MDA slots         | The number of card slots available                                                                                                                                                                           |
| Installed MDAs              | The number of cards installed                                                                                                                                                                                |
| Part number                 | The chassis part number                                                                                                                                                                                      |
| CLEI code                   | The Common Language Equipment Identifier (CLEI) code string for the router                                                                                                                                   |
| Serial number               | The chassis serial number                                                                                                                                                                                    |
| Manufacture date            | The chassis manufacture date                                                                                                                                                                                 |
| Manufacturing string        | A factory-inputted manufacturing text string                                                                                                                                                                 |
| Manufacturing deviations    | A record of changes done to the hardware or software that is outside the normal revision control process                                                                                                     |
| Administrative state        | up: the card is administratively up                                                                                                                                                                          |
|                             | down: the card is administratively down                                                                                                                                                                      |
| Operational State           | up: the card is operationally up<br>down: the card is operationally down<br>provisioned: there is no card in the slot but it has been preconfigured<br>failed: the provisioned card has operationally failed |
| Temperature                 | The internal chassis temperature                                                                                                                                                                             |
| Temperature threshold       | The value above which the internal temperature must rise in order to indicate that the temperature is critical                                                                                               |
| Software boot (rom) version | The version of the boot ROM image                                                                                                                                                                            |
| Software boot version       | The version of the boot image                                                                                                                                                                                |
| Software version            | The software version number                                                                                                                                                                                  |
| Time of last boot           | The date and time the most recent boot occurred                                                                                                                                                              |
| Current alarm state         | The alarm conditions for the adapter card                                                                                                                                                                    |
| Base MAC address            | The base MAC address of the hardware component                                                                                                                                                               |
| Memory capacity             | The memory capacity of the adapter card                                                                                                                                                                      |

### Output Example

The following example displays detailed CSMv2 information for the 7705 SAR-8.

```
*A:ALU-1># show card "a" detail
=====
Card A
=====
Slot Provisioned Type Admin Operational Comments
 Equipped Type (if different) State State

A csmv2-10g up up/active

BOF last modified : N/A
Config file version : WED SEP 01 15:49:15 2015 UTC
Config file last modified : 2016/01/12 21:08:27
Config file last saved : 2016/07/14 18:14:07
M/S clocking ref state : primary
Flash - cf3:
 Administrative State : up
 Operational state : up
 Serial number : serial-3
 Firmware revision : v1.0
 Model number : SMART CF
 Size : 1,953 MB
 Free space : 1,948 MB
Hardware Data
 Part number : Sim Part#
 CLEI code : Sim CLEI
 Serial number : card-2
 Manufacture date : 01012003
 Manufacturing string : Sim MfgString card-2
 Manufacturing deviations : Sim MfgDeviation card-2
 Administrative state : up
 Operational state : up
 Temperature : 35C
 Temperature threshold : 75C
 Software boot (rom) version : simulated
 Software version : TiMOS-B-8.0.I536 both/i386 NOKIA SAR 7705 *
 Time of last boot : 2016/08/05 20:57:10
 Current alarm state : alarm cleared
 Base MAC address : a4:58:02:00:00:00
 Memory capacity : 2,048 MB
=====
```

**Table 35 Show CSM Card Output Fields**

| Label                        | Description                                                                                 |
|------------------------------|---------------------------------------------------------------------------------------------|
| Slot                         | The slot number of the card in the chassis                                                  |
| Provisioned Type             | The card type that is configured for the slot                                               |
| Equipped Type (if different) | The card type that is actually populated in the slot if different from the provisioned type |

**Table 35 Show CSM Card Output Fields (Continued)**

| Label                     | Description                                                                                                                                                                          |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Admin State               | up: the CSM is administratively up<br>down: the CSM is administratively down                                                                                                         |
| Operational State         | up: the CSM is operationally up<br>down: the CSM is operationally down<br>active: the CSM is in active mode (for redundancy)<br>standby: the CSM is in standby mode (for redundancy) |
| Comments                  | Provides other information about the card                                                                                                                                            |
| BOF last modified         | The date and time of the most recent BOF modification                                                                                                                                |
| Config file version       | The configuration file version                                                                                                                                                       |
| Config file last modified | The date and time of the most recent config file modification                                                                                                                        |
| Config file last saved    | The date and time of the most recent config file save                                                                                                                                |
| M/S clocking ref state    | primary: the card is acting as the primary (active) CSM in a redundant system                                                                                                        |
|                           | secondary: the card is acting as the standby (secondary) CSM in a redundant system                                                                                                   |
| Admin State               | up: the compact flash is administratively up                                                                                                                                         |
|                           | down: the compact flash is administratively down                                                                                                                                     |
| Operational State         | up: the compact flash is operationally up                                                                                                                                            |
|                           | down: the compact flash is operationally down                                                                                                                                        |
| Serial number             | The compact flash serial number                                                                                                                                                      |
| Firmware revision         | The compact flash firmware version number                                                                                                                                            |
| Model number              | The compact flash model number                                                                                                                                                       |
| Size                      | The memory capacity on the compact flash                                                                                                                                             |
| Free space                | The amount of free space on the compact flash                                                                                                                                        |
| Part number               | The CSM part number                                                                                                                                                                  |
| CLEI code                 | The code used to identify the router                                                                                                                                                 |
| Serial number             | The CSM serial number                                                                                                                                                                |
| Manufacture date          | The chassis manufacture date                                                                                                                                                         |
| Manufacturing string      | A factory-inputted manufacturing text string                                                                                                                                         |

**Table 35 Show CSM Card Output Fields (Continued)**

| Label                       | Description                                                                                                    |
|-----------------------------|----------------------------------------------------------------------------------------------------------------|
| Manufacturing deviations    | A record of changes done to the hardware or software that is outside the normal revision control process       |
| Administrative state        | up: the CSM is administratively up                                                                             |
|                             | down: the CSM is administratively down                                                                         |
| Operational state           | up: the CSM is operationally up                                                                                |
|                             | down: the CSM is operationally down                                                                            |
| Temperature                 | The internal chassis temperature                                                                               |
| Temperature threshold       | The value above which the internal temperature must rise in order to indicate that the temperature is critical |
| Software boot (rom) version | The version of the boot image                                                                                  |
| Software version            | The software version number                                                                                    |
| Time of last boot           | The date and time the most recent boot occurred                                                                |
| Current alarm state         | The alarm conditions for the specific card                                                                     |
| Base MAC address            | The base MAC address of the hardware component                                                                 |
| Memory capacity             | The total amount of memory on the CSM                                                                          |

## mda

**Syntax** **mda** [*slot* [*/mda*]] [**detail**]  
**mda** *slot/mda* **statistics** [**source-mda** | **dest-mda** | **ip-transport** | **mirror** | **security**  
**[encryption | firewall]**  
**mda aggregate-statistics** [**mirror**]  
**mda with-fabric-stats**  
**mda** [*slot* [*/mda*]] **ring**

**Context** show

**Description** This command displays adapter card information and statistics collected from a specified adapter card and associated fabric ports.

The **security encryption** and **security firewall** keywords are used for the 7705 SAR-18 and 7705 SAR-8 (with CSMv2) only. They do not apply to the 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-M, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-W, or 7705 SAR-Wx. These routers use the **mda aggregate-statistics** command instead.

The **statistics ip-transport** keywords apply only to the 7705 SAR-8 and 7705 SAR-18.



The **statistics mirror** keywords apply only to the 7705 SAR-8, 7705 SAR-18, and 7705 SAR-X.

The **aggregate-statistics mirror** keywords apply only to the 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-M, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-W, and 7705 SAR-Wx.

The **with-fabric-stats**, **aggregate-statistics**, and **statistics source-mds/dest-mds** commands are not supported on the 7705 SAR-X.

If no command line options are specified, a summary output of all adapter cards is displayed.

#### Parameters

*slot* — the slot number of the IOM

**Values** 1

*mda* — the slot number of the adapter card

**Values** 1 to 6 (7705 SAR-8)  
1 to 12 (7705 SAR-18)

**source-mds** — displays network and access ingress traffic statistics from the specified adapter card going towards the fabric and towards a destination adapter card. The sum of traffic forwarded or dropped is also displayed.

Statistics from the fabric are not displayed when this keyword is used.

**dest-mds** — displays network and access ingress statistics for all adapter cards going towards the fabric and destined for the specified destination adapter card. The following are also collected: global fabric statistics, fabric firewall statistics, and fabric port statistics if the destination adapter card has the collection of fabric statistics enabled.

The sum of traffic forwarded or dropped is also displayed.

**ip-transport** — displays IP transport queue forward and drop statistics for the 7705 SAR-18 and 7705 SAR-8 only

**mirror** — displays mirror queue forwards and drops

**security encryption** — displays IPSec encryption statistics for the 7705 SAR-18 and 7705 SAR-8 only

**security firewall** — displays firewall security statistics for the 7705 SAR-18 and 7705 SAR-8 only

**aggregate-statistics** — displays aggregate statistics for access and network ingress traffic switched through the fabric when fabric shapers are configured. This command is supported on the 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-M, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-W, and 7705 SAR-Wx. Additionally, on the 7705 SAR-Ax, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-W, and 7705 SAR-Wx, the displays include IPSec security statistics. On the 7705 SAR-Ax, 7705 SAR-H, 7705 SAR-Hc, and 7705 SAR-Wx, the displays also include firewall queue statistics. On the 7705 SAR-H and 7705 SAR-Hc, the displays also include IP transport statistics.

**with-fabric-stats** — displays all adapter cards that have been configured to collect fabric port statistics. For the 7705 SAR-8, only one adapter card can have fabric statistics enabled. For the 7705 SAR-18, multiple adapter cards can have fabric statistics enabled. This command is not supported on the 7705 SAR-M, 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-W, 7705 SAR-Wx, or 7705 SAR-X.

**ring** — accesses the commands to show the FDB and statistics on a ring adapter card. This command is only supported on the 2-port 10GigE (Ethernet) Adapter card and 2-port 10GigE (Ethernet) module. See [fdb](#).

**Output**     The following outputs are examples of MDA information:

- MDA ([Output Example](#), [Table 36](#))
- MDA Detailed ([Output Example](#), [Table 37](#))
- MDA Fabric Statistics ([Output Example \(source-mda and dest-mda\)](#), [Table 38](#))
- MDA Fabric Statistics ([Output Example \(ip-transport statistics\)](#), [Table 39](#))
- MDA Fabric Statistics ([Output Example \(mirror statistics\)](#), [Table 40](#))
- MDA Fabric Security Encryption Statistics ([Output Example \(security encryption\)](#), [Table 41](#))
- MDA Fabric Security Firewall Statistics ([Output Example \(security firewall\)](#), [Table 42](#))
- MDA With Fabric Statistics ([Output Example](#), [Table 43](#))
- MDA Aggregate-Statistics ([Output Example](#), [Table 44](#))

**Output Example**

```
*A:ALU-1># show mda 1/1
=====
MDA 1/1
=====
Slot Mda Provisioned Type Admin Operational
 Mda Equipped Type (if different) State State

1 1 a6-em up provisioned
=====
*A:ALU-1>

*A:ALU-1># show mda 1/2
=====
MDA 1/2
=====
Slot Mda Provisioned Type Admin Operational
 Mda Equipped Type (if different) State State

1 2 a4-oc3 up provisioned
=====
*A:ALU-1>#

*A:ALU-1># show mda 1/3
=====
MDA 1/3
=====
Slot Mda Provisioned Type Admin Operational
```

```

Equipped Type (if different) State State

1 3 a16-chds1 up provisioned
=====
*A:ALU-1>#

*A:ALU-1># show mda 1/4
=====
MDA 1/4
=====
Slot Mda Provisioned Type Admin Operational
 Mda Equipped Type (if different) State State

1 4 a4-chds3 up provisioned
=====
*A:ALU-1>#

*A:ALU-1># show mda 1/6
=====
MDA 1/6
=====
Slot Mda Provisioned Type Admin Operational
 Mda Equipped Type (if different) State State

1 6 a2-choc3 Unknown up failed
=====
*A:ALU-1>#

```

**Table 36** Show MDA Output Fields

| Label                        | Description                                                                                                                                                                                                                                  |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Slot                         | The card slot number (always 1)                                                                                                                                                                                                              |
| Mda                          | The adapter card slot number                                                                                                                                                                                                                 |
| Provisioned Type             | The provisioned adapter card type                                                                                                                                                                                                            |
| Equipped Type (if different) | The adapter card type actually installed in the slot if different from the provisioned type                                                                                                                                                  |
| Admin State                  | up: the adapter card is administratively up<br>down: the adapter card is administratively down                                                                                                                                               |
| Operational State            | up: the adapter card is operationally up<br>down: the adapter card is operationally down<br>provisioned: there is no adapter card in the slot but it has been preconfigured<br>failed: the provisioned adapter card has operationally failed |

## Output Example

The following example shows the details of a 12-port Serial Data Interface card in slot 1.

```
*A:ALU-1># show mda 1/1 detail
=====
MDA 1/1 detail
=====
Slot Mda Provisioned Type Admin Operational
 Equipped Type (if different) State State

1 1 a12-sdiv2 up provisioned

MDA Specific Data
 Maximum port count : 12
 Number of ports equipped : 12
 Transmit timing selected : CPM Card A
 Sync interface timing status : Qualified
 Network ingress queue policy : default
 Network ingress fabric policy : 1
 Access ingress fabric policy : 1
 Fabric Stats Enabled : FALSE
 Capabilities : Serial, PPP, FR, HDLC, cHDLC, CEM
 Min channel size : PDH DS0 Group
 Max channel size : Serial RS-232
 Max number of channels : 12
 Channels in use : 2
CEM MDA Specific Data
 Clock Mode : n/a
Hardware Data
 Part number :
 CLEI code :
 Serial number :
 Manufacture date :
 Manufacturing string :
 Manufacturing deviations :
 Administrative state : up
 Operational state : provisioned
 Software version : N/A
 Time of last boot : N/A
 Current alarm state : alarm cleared
 Base MAC address :
=====
*A:ALU-1>#
```

The following example shows the details of a 6-port E&M Adapter card in slot 1.

```
*A:ALU-1># show mda 1/1 detail
=====
MDA 1/1 detail
=====
Slot Mda Provisioned Type Admin Operational
 Equipped Type (if different) State State

1 1 a6-em up provisioned

MDA Specific Data
 Maximum port count : 6
 Number of ports equipped : 6
 Network ingress queue policy : default
 Transmit timing selected : CPM Card A
 Sync interface timing status : Qualified
 Network ingress fabric policy : 1
 Access ingress fabric policy : 1
 Fabric Stats Enabled : FALSE
 Capabilities : Voice, CEM
 Min channel size : PDH DS0 Group
 Max channel size : Voice E&M
 Max number of channels : 6
 Channels in use : 6
CEM MDA Specific Data
 Clock Mode : n/a

Voice MDA Specific Data
 Companding Law : a-law
 Signaling Type : type-v
Hardware Data
 Part number : 3HE03126AAAA0101
 CLEI code : IPUCAXU1AA
 Serial number : NS000L00065
 Manufacture date : 10142009
 Manufacturing string : E&M Init
 Manufacturing deviations :
 Administrative state : up
 Operational state : up
 Temperature : 31C
 Temperature threshold : 75C
 Software version : N/A
 Time of last boot : 2010/01/08 14:08:17
 Current alarm state : alarm cleared
 Base MAC address : 00:25:ba:c2:cb:fe
=====
*A:ALU-1>#
```

The following example shows the details of a 4-port OC3/STM1 Clear Channel Adapter card in slot 2.

```
*A:ALU-1># show mda 1/2 detail
=====
MDA 1/2 detail
=====
Slot Mda Provisioned Type Admin Operational
 Equipped Type (if different) State State

1 2 a4-oc3 up provisioned

MDA Specific Data
 Maximum port count : 4
 Number of ports equipped : 4
 Network ingress queue policy : default
 Transmit timing selected : CPM Card A
 Sync interface timing status : Qualified
 Network ingress fabric policy : 1
 Access ingress fabric policy : 1
 Fabric Stats Enabled : FALSE
 Capabilities : Sonet, PPP, ATM
 Min channel size : Sonet STS-3
 Max channel size : Sonet STS-3
 Max number of channels : 4
 Channels in use : 3

Hardware Data
 Part number :
 CLEI code :
 Serial number :
 Manufacture date :
 Manufacturing string :
 Manufacturing deviations :
 Administrative state : up
 Operational state : provisioned
 Software version : N/A
 Time of last boot : N/A
 Current alarm state : alarm cleared
 Base MAC address :
=====
A:ALU-1>#
```

The following example shows the details of a 16-port T1/E1 ASAP Adapter card in slot 3.

```
*A:ALU-1># show mda 1/3 detail
=====
MDA 1/3 detail
=====
Slot Mda Provisioned Type Admin Operational
 Equipped Type (if different) State State

1 3 a16-chds1 up provisioned

MDA Specific Data
 Maximum port count : 16
 Number of ports equipped : 16
 Network ingress queue policy : default
 Transmit timing selected : CPM Card A
 Sync interface timing status : Qualified
 Network ingress fabric policy : 1
 Access ingress fabric policy : 1
 Fabric Stats Enabled : FALSE
 Capabilities : TDM, PPP, ATM, CEM
 Min channel size : PDH DS0 Group
 Max channel size : PDH DS1
 Max number of channels : 256
 Channels in use : 4
CEM MDA Specific Data
 Clock Mode : adaptive
Hardware Data
 Part number :
 CLEI code :
 Serial number :
 Manufacture date :
 Manufacturing string :
 Manufacturing deviations :
 Administrative state : up
 Operational state : provisioned
 Software version : N/A
 Time of last boot : N/A
 Current alarm state : alarm active
 Base MAC address :
=====
*A:ALU-1>#
```

The following example shows the details of a 4-port DS3/E3 Adapter card in slot 4.

```
*A:ALU-1># show mda 1/4 detail
=====
MDA 1/4 detail
=====
Slot Mda Provisioned Type Admin Operational
 Equipped Type (if different) State State

1 4 a4-chds3 up up

MDA Specific Data
 Maximum port count : 4
 Number of ports equipped : 4
 Network ingress queue policy : default
 Transmit timing selected : CPM Card A
 Sync interface timing status : Qualified
 Network ingress fabric policy : 1
 Access ingress fabric policy : 1
 Fabric Stats Enabled : FALSE
 Capabilities : TDM, PPP, ATM
 Min channel size : PDH DS3
 Max channel size : PDH DS3
 Max number of channels : 2048
 Channels in use : 4

Hardware Data
 Part number : 3HE04962AAAA0101
 CLEI code : IPUIBFXDAA
 Serial number : NS000L0007N
 Manufacture date : 10272009
 Manufacturing string : Initial release
 Manufacturing deviations :
 Administrative state : up
 Operational state : up
 Temperature : 28C
 Temperature threshold : 75C
 Software version : N/A
 Time of last boot : 2009/11/23 12:59:45
 Current alarm state : alarm cleared
 Base MAC address : 00:25:ba:33:2d:7c
=====
```



The following example shows the details of a 2-port OC3/STM1 Channelized Adapter card in slot 6.

```
A:ALU-1># show mda 1/6 detail
=====
MDA 1/6 detail
=====
Slot Mda Provisioned Type Admin Operational
 Mda Equipped Type (if different) State State

1 6 a2-choc3 up failed

MDA Specific Data
 Maximum port count : 2
 Number of ports equipped : 2
 Network ingress queue policy : default
 Transmit timing selected : CPM Card A
 Sync interface timing status : Qualified
 Network ingress fabric policy : 1
 Access ingress fabric policy : 1
 Fabric Stats Enabled : FALSE
 Capabilities : Sonet, TDM, PPP, ATM, CEM
 Min channel size : PDH DS0 Group
 Max channel size : PDH DS3
 Max number of channels : 512
 Channels in use : 1
CEM MDA Specific Data
 Clock Mode : adaptive
Hardware Data
 Part number :
 CLEI code :
 Serial number :
 Manufacture date :
 Manufacturing string :
 Manufacturing deviations :
 Administrative state : up
 Operational state : failed
 Failure Reason : MDA type unknown in this build
 Software version : N/A
 Time of last boot : N/A
 Current alarm state : alarm active
 Base MAC address :
=====
A:ALU-1>#
```

The following example shows the details of an 8-port Voice & Teleprotection card in slot 6.

```
*A:ALU-1> show mda 1/6 detail
=====
MDA 1/6 detail
=====
Slot Mda Provisioned Type Admin Operational
 Mda Equipped Type (if different) State State

1 6 a8-vt up up

MDA Specific Data
 Maximum port count : 8
 Number of ports equipped : 8
 Network ingress queue policy : default
 Transmit timing selected : CPM Card A
 Sync interface timing status : Qualified
 Network ingress fabric policy : 1
 Access ingress fabric policy : 1
 Fabric Stats Enabled : FALSE
 Capabilities : TDM, Voice, CEM
 Min channel size : PDH DS0 Group
 Max channel size : Voice FXO
 Max number of channels : 8
 Channels in use : 2

CEM MDA Specific Data
 Clock Mode : n/a

Voice MDA Specific Data
 Companding Law : mu-law
 Signaling Type : n/a

Hardware Data
 Part number : Sim Part#
 CLEI code : Sim CLEI
 Serial number : mda-6
 Manufacture date : 01012003
 Manufacturing variant : ch1: 1471 ch2: 1491
 Manufacturing string : Sim MfgString mda-6
 Manufacturing deviations : Sim MfgDeviation mda-6
 Administrative state : down
 Operational state : down
 Temperature : 36C
 Temperature threshold : 75C
 Software version : N/A
 Time of last boot : 2011/07/18 14:39:12
 Current alarm state : alarm cleared
 Base MAC address : a4:8d:01:06:00:01
=====
*A:ALU-1>#
```

The following example shows the details of an 8-port FXO Adapter card in slot 6.

```
*A:ALU-1> show mda 1/6 detail
=====
MDA 1/6 detail
=====
Slot Mda Provisioned Type Admin Operational
 Equipped Type (if different) State State

1 6 a8-fxo up up

MDA Specific Data
 Maximum port count : 8
 Number of ports equipped : 8
 Network ingress queue policy : default
 Network ingress fabric policy : 1
 Access ingress fabric policy : 1
 Fabric Stats Enabled : FALSE
 Capabilities : Voice, CEM
 Min channel size : PDH DS0 Group
 Max channel size : Voice FXO
 Max number of channels : 8
 Channels in use : 1

CEM MDA Specific Data
 Clock Mode : n/a

Voice MDA Specific Data
 Companding Law : mu-law
 Signaling Type : n/a

Hardware Data
 Part number : Sim Part#
 CLEI code : Sim CLEI
 Serial number : mda-6
 Manufacture date : 01012003
 Manufacturing variant : ch1: 1471 ch2: 1491
 Manufacturing string : Sim MfgString mda-6
 Manufacturing deviations : Sim MfgDeviation mda-6
 Administrative state : down
 Operational state : down
 Temperature : 36C
 Temperature threshold : 75C
 Software version : N/A
 Time of last boot : 2011/07/18 14:39:12
 Current alarm state : alarm cleared
 Base MAC address : a4:8d:01:06:00:01
=====
*A:ALU-1>#
```

The following example shows the details of a 10-port 1GigE/1-port 10GigE X-Adapter card in x10-1gb-sfp mode in slot X1.

```
*A:ALU-1> show mda 1/X1 detail
=====
MDA 1/X1 detail
=====
Slot Mda Provisioned Type Admin Operational
 Mda Equipped Type (if different) State State

1 X1 x-10GigE up up

MDA Specific Data
 Maximum port count : 10
 Number of ports equipped : 10
 Network ingress queue policy : default
 Network ingress fabric policy : 1
 Access ingress fabric policy : 1
 Fabric Stats Enabled : FALSE
 Capabilities : Ethernet
 Min channel size : Sonet STS-192
 Max channel size : Sonet STS-192
 Max number of channels : 10
 Channels in use : 2
 Capability mode : x10-1gb-sfp

Hardware Data
 Part number : Sim Part#
 CLEI code : Sim CLEI
 Serial number : mda-X1
 Manufacture date : 01012011
 Manufacturing variant : ch1: 1471 ch2: 1491
 Manufacturing string : Sim MfgString mda-X1
 Manufacturing deviations : Sim MfgDeviation mda-X1
 Administrative state : down
 Operational state : down
 Software version : N/A
 Time of last boot : 2011/07/18 14:39:12
 Current alarm state : alarm cleared
 Base MAC address : a4:8d:01:06:00:01
=====
*A:ALU-1>#
```

The following example shows the details of a 2-port 10GigE (Ethernet) Adapter card.

```
*A:ALU-1> show mda 1/11 detail
=====
MDA 1/11 detail
=====
Slot Mda Provisioned Type Admin Operational
 Mda Equipped Type (if different) State State

1 11 a2-10gb-xfp up failed

MDA Specific Data
 Maximum port count : 3
 Number of ports equipped : 3
 Sync-E Capable : TRUE
 Network ingress queue policy : r.nw.q3
 Network Ring queue policy : r.nw.q2
 Network Ring qos policy : 1
 Network ingress fabric policy : 1
 Access ingress fabric policy : 1
 Fabric Stats Enabled : FALSE
 Capabilities : Ethernet
 Min channel size : Sonet STS-192
 Max channel size : Sonet STS-192
 Max number of channels : 3
 Channels in use : 0

Hardware Data
 Part number :
 CLEI code :
 Serial number :
 Manufacture date :
 Manufacturing string :
 Manufacturing deviations :
 Administrative state : up
 Operational state : failed
 Failure Reason : MDA type unknown in this build
 Software version : N/A
 Time of last boot : N/A
 Current alarm state : alarm active
 Base MAC address :

QOS Settings

=====
*A:ALU-1>#
```

**Table 37 Show MDA Detail Output Fields**

| Label                        | Description                                                                                                                                                                                                                                  |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Slot                         | The card slot number (always 1)                                                                                                                                                                                                              |
| Mda                          | The adapter card slot number                                                                                                                                                                                                                 |
| Provisioned Type             | The provisioned adapter card type                                                                                                                                                                                                            |
| Equipped Type (if different) | The adapter card type actually installed in the slot if different from the provisioned type                                                                                                                                                  |
| Admin State                  | up: the adapter card is administratively up<br>down: the adapter card is administratively down                                                                                                                                               |
| Operational State            | up: the adapter card is operationally up<br>down: the adapter card is operationally down<br>provisioned: there is no adapter card in the slot but it has been preconfigured<br>failed: the provisioned adapter card has operationally failed |
| <b>MDA Specific Data</b>     |                                                                                                                                                                                                                                              |
| Maximum port count           | The maximum number of ports that can be equipped on the adapter card                                                                                                                                                                         |
| Number of ports equipped     | The number of ports that are actually equipped on the adapter card                                                                                                                                                                           |
| Transmit timing selected     | The CSM clock used for the transmit clock. It should be the active CSM except during a system or MDA initialization or during an activity switch.                                                                                            |
| Sync-E Capable               | TRUE: the adapter card supports synchronous Ethernet timing                                                                                                                                                                                  |
|                              | FALSE: the adapter card does not support synchronous Ethernet timing                                                                                                                                                                         |
| Sync interface timing status | The status of synchronization interface timing; it should be qualified except during a system or MDA initialization or during an activity switch                                                                                             |
| Network Ring queue policy    | The network queue policy applied to the ring port on the adapter card to define the queuing structure for this object                                                                                                                        |
| Network Ring qos policy      | The network QoS policy applied to the ring port on this adapter card                                                                                                                                                                         |

**Table 37 Show MDA Detail Output Fields (Continued)**

| Label                          | Description                                                                                                  |
|--------------------------------|--------------------------------------------------------------------------------------------------------------|
| Network ingress queue policy   | The network ingress queue policy applied to the adapter card to define the queuing structure for this object |
| Network ingress fabric policy  | The network ingress fabric policy applied to the adapter card                                                |
| Access ingress fabric policy   | The access ingress fabric policy applied to the adapter card                                                 |
| Fabric Stats Enabled           | TRUE: the collection of fabric statistics is enabled on the adapter card                                     |
|                                | FALSE: the collection of fabric statistics is disabled on the adapter card                                   |
| Capabilities                   | The protocols that can be run on the adapter card                                                            |
| Min channel size               | The minimum channel size on the adapter card                                                                 |
| Max channel size               | The maximum channel size on the adapter card                                                                 |
| Max number of channels         | The maximum number of channels supported on the adapter card                                                 |
| Channels in use                | The number of channels being used on the adapter card                                                        |
| Capability mode                | The adapter card mode ( <b>mda-mode</b> ) for cards that support mda-mode                                    |
| <b>CEM MDA Specific Data</b>   |                                                                                                              |
| Clock Mode                     | The clocking mode used on the adapter card                                                                   |
| <b>Voice MDA Specific Data</b> |                                                                                                              |
| Companding Law                 | The companding law used on the adapter card                                                                  |
| Signaling Type                 | The signaling type used on the adapter card                                                                  |
| <b>Hardware Data</b>           |                                                                                                              |
| Part number                    | The hardware part number                                                                                     |
| CLEI code                      | The code used to identify the adapter card                                                                   |
| Serial number                  | The adapter card part number                                                                                 |
| Manufacture date               | The adapter card manufacture date                                                                            |
| Manufacturing variant          | The adapter card manufacture variant                                                                         |
| Manufacturing string           | A factory-inputted manufacturing text string                                                                 |

**Table 37 Show MDA Detail Output Fields (Continued)**

| Label                    | Description                                                                                                    |
|--------------------------|----------------------------------------------------------------------------------------------------------------|
| Manufacturing deviations | A record of changes done to the hardware or software that is outside the normal revision control process       |
| Administrative state     | up: the adapter card is administratively up                                                                    |
|                          | down: the adapter card is administratively down                                                                |
| Operational state        | up: the adapter card is operationally up                                                                       |
|                          | down: the adapter card is operationally down                                                                   |
|                          | provisioned: there is no adapter card in the slot but it has been preconfigured                                |
|                          | failed: the provisioned adapter card has operationally failed                                                  |
| Temperature              | The internal chassis temperature                                                                               |
| Temperature threshold    | The value above which the internal temperature must rise in order to indicate that the temperature is critical |
| Software version         | The software version number                                                                                    |
| Time of last boot        | The date and time the most recent boot occurred                                                                |
| Current alarm state      | The alarm conditions for the specific adapter card                                                             |
| Base MAC address         | The base MAC address of the hardware component                                                                 |

**Output Example (source-mds and dest-mds)**

The following example shows an MDA fabric statistics display if the **source-mds** keyword is used.

```
*A:ALU-1># show mda 1/5 statistics source-mds
=====
Statistic of Source MDA 1/5
=====

Unicast to Destination MDA 1/1 Packets Octets
 Network In Profile forwarded : 4203305 311044570
 Network In Profile dropped : 933497 69078778
 Network Out Profile forwarded: 934317 69139458
 Network Out Profile dropped : 700120 51808880
 Access In Profile forwarded : 4246150 314215100
 Access Out Profile forwarded : 708419 52423006
 Access dropped : 1885052 139493848
Unicast to Destination MDA 1/2 Packets Octets
 Network In Profile forwarded : 187130 13847620
 Network In Profile dropped : 41164 3046136
 Network Out Profile forwarded: 41766 3090684
```



```

 Network Out Profile dropped : 30873 2284602
 Access In Profile forwarded : 640974 47432076
 Access Out Profile forwarded : 108549 8032626
 Access dropped : 279832 20707568
Unicast to Destination MDA 1/3 Packets Octets
 Network In Profile forwarded : 229693 16997282
 Network In Profile dropped : 50499 3736926
 Network Out Profile forwarded: 51280 3794720
 Network Out Profile dropped : 37872 2802528
 Access In Profile forwarded : 140170 10372580
 Access Out Profile forwarded : 24595 1820030
 Access dropped : 58680 4342320
Unicast to Destination MDA 1/4 Packets Octets
 Network In Profile forwarded : 403805 29881570
 Network In Profile dropped : 89105 6593770
 Network Out Profile forwarded: 90008 6660592
 Network Out Profile dropped : 66827 4945198
 Access In Profile forwarded : 256362 18970788
 Access Out Profile forwarded : 44097 3263178
 Access dropped : 109920 8134080
Unicast to Destination MDA 1/5 Packets Octets
 Network In Profile forwarded : 396270 403402860
 Network In Profile dropped : 87752 89331536
 Network Out Profile forwarded: 88190 89777420
 Network Out Profile dropped : 65817 67001706
 Access In Profile forwarded : 2719693 201257282
 Access Out Profile forwarded : 455549 33710626
 Access dropped : 1202105 88955770
Unicast to Destination MDA 1/6 Packets Octets
 Network In Profile forwarded : 585296 595831328
 Network In Profile dropped : 129704 132038672
 Network Out Profile forwarded: 130222 132565996
 Network Out Profile dropped : 97278 99029004
 Access In Profile forwarded : 5948753 440207722
 Access Out Profile forwarded : 995919 73698006
 Access dropped : 2630809 194679866
Multipoint Packets Octets
 Network In Profile forwarded : 585296 595831328
 Network In Profile dropped : 129704 132038672
 Network Out Profile forwarded: 130222 132565996
 Network Out Profile dropped : 97278 99029004
 Access In Profile forwarded : 5948753 440207722
 Access Out Profile forwarded : 995919 73698006
 Access dropped : 2630809 194679866

Total Network forwarded : 7341282 1676034100
Total Network dropped : 2330508 531697736
Total Access forwarded : 16289230 1205403020
Total Access dropped : 6166398 456313452

```

The following example shows an MDA fabric statistics display if the **dest-mds** keyword is used.

```

*A:ALU-1># show mda 1/5 statistics dest-mds
=====
Statistic of Destination MDA 1/5
=====

```

-----  
 Drop Events: 0  
 -----

|                                   |         |            |
|-----------------------------------|---------|------------|
| Unicast from Source MDA 1/1       | Packets | Octets     |
| Network In Profile forwarded :    | 520148  | 529510664  |
| Network In Profile dropped :      | 64852   | 66019336   |
| Network Out Profile forwarded:    | 65075   | 66246350   |
| Network Out Profile dropped :     | 32425   | 33008650   |
| Access In Profile forwarded :     | 5614550 | 415476700  |
| Access Out Profile forwarded :    | 661714  | 48966836   |
| Access dropped :                  | 657705  | 48670170   |
| Unicast from Source MDA 1/2       | Packets | Octets     |
| Network In Profile forwarded :    | 4146    | 1733028    |
| Network In Profile dropped :      | 480     | 200640     |
| Network Out Profile forwarded:    | 531     | 221958     |
| Network Out Profile dropped :     | 240     | 100320     |
| Access In Profile forwarded :     | 204744  | 15151056   |
| Access Out Profile forwarded :    | 15318   | 1133532    |
| Access dropped :                  | 25565   | 1891810    |
| Unicast from Source MDA 1/3       | Packets | Octets     |
| Network In Profile forwarded :    | 32470   | 30617292   |
| Network In Profile dropped :      | 3890    | 3664068    |
| Network Out Profile forwarded:    | 4127    | 3894682    |
| Network Out Profile dropped :     | 1933    | 1818878    |
| Access In Profile forwarded :     | 510301  | 37762274   |
| Access Out Profile forwarded :    | 34691   | 2567134    |
| Access dropped :                  | 66951   | 4954374    |
| Unicast from Source MDA 1/4       | Packets | Octets     |
| Network In Profile forwarded :    | 0       | 0          |
| Network In Profile dropped :      | 0       | 0          |
| Network Out Profile forwarded:    | 0       | 0          |
| Network Out Profile dropped :     | 0       | 0          |
| Access In Profile forwarded :     | 491695  | 126976722  |
| Access Out Profile forwarded :    | 24867   | 7435050    |
| Access dropped :                  | 23790   | 2271932    |
| Unicast from Source MDA 1/5       | Packets | Octets     |
| Network In Profile forwarded :    | 950101  | 967202818  |
| Network In Profile dropped :      | 118649  | 120784682  |
| Network Out Profile forwarded:    | 118803  | 120941454  |
| Network Out Profile dropped :     | 59322   | 60389796   |
| Access In Profile forwarded :     | 187631  | 191008358  |
| Access Out Profile forwarded :    | 12594   | 12820692   |
| Access dropped :                  | 24894   | 25342092   |
| Unicast from Source MDA 1/6       | Packets | Octets     |
| Network In Profile forwarded :    | 1494108 | 1521001944 |
| Network In Profile dropped :      | 186642  | 190001556  |
| Network Out Profile forwarded:    | 186811  | 190173598  |
| Network Out Profile dropped :     | 93314   | 94993652   |
| Access In Profile forwarded :     | 1473381 | 1499873582 |
| Access Out Profile forwarded :    | 173421  | 176539142  |
| Access dropped :                  | 173142  | 176255492  |
| -----                             |         |            |
| Total Unicast Network forwarded : | 3376320 | 3431543788 |
| Total Unicast Network dropped :   | 561747  | 570981578  |
| Total Unicast Access forwarded :  | 9404907 | 2535711078 |
| Total Unicast Access dropped :    | 972047  | 259385870  |
| -----                             |         |            |
| Fabric Firewall Stats             | Packets | Octets     |
| Unicast Forwarded :               | 1929191 | N/A        |

```

Multicast Forwarded : 1046297 N/A
Total Forwarded : 2975488 0
Total Dropped : 0 0

Fabric Global Stats Packets Octets
Unicast Forwarded : 1929191 N/A
Multicast Forwarded : 1046297 N/A
Total Forwarded : 2975488 N/A
Total Dropped : 0 N/A
=====
*A:ALU-1>#
```

**Table 38**      **Show MDA Fabric Statistics Output Fields**

| Label                   | Description                                                                                                                                                                                                                                                                             |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Statistic of Source MDA | If the source-mds keyword is specified in the show statistics command, displays the network and access ingress traffic statistics from the specified adapter card towards the fabric and towards a destination adapter card. The sum of traffic forwarded or dropped is also displayed. |

**Table 38 Show MDA Fabric Statistics Output Fields (Continued)**

| Label                                     | Description                                                                                                                                                                                                                                                  |
|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Unicast to Destination MDA Packets/Octets | Network In Profile forwarded: the number of unicast network in-profile packets/octets forwarded from the adapter card specified in the show mda command towards the fabric, then to the output destination adapter card                                      |
|                                           | Network In Profile dropped: the number of unicast network in-profile packets/octets dropped from the adapter card specified in the show mda command towards the fabric, then to the output destination adapter card <sup>1</sup>                             |
|                                           | Network Out Profile forwarded: the number of unicast network out-of-profile packets/octets forwarded from the adapter card specified in the show mda command towards the fabric, then to the output destination adapter card <sup>1</sup>                    |
|                                           | Network Out Profile dropped: the number of unicast network out-of-profile packets/octets dropped from the adapter card specified in the show mda command towards the fabric, then to the output destination adapter card <sup>1</sup>                        |
|                                           | Access In Profile forwarded: the number of unicast access in-profile packets/octets forwarded from the adapter card specified in the show mda command towards the fabric, then to the output destination adapter card <sup>1</sup>                           |
|                                           | Access Out Profile forwarded: the number of unicast access out-of-profile packets/octets forwarded from the adapter card specified in the show mda command towards the fabric, then to the output destination adapter card <sup>1</sup>                      |
|                                           | Access dropped: the number of unicast access out-of-profile packets/octets and access in-profile packets/octets dropped from the adapter card specified in the show mda command towards the fabric, then to the output destination adapter card <sup>1</sup> |

**Table 38 Show MDA Fabric Statistics Output Fields (Continued)**

| Label                                  | Description                                                                                                                                                                                                                                                     |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Multipoint (for source-mds)            | Network In Profile forwarded: the number of multipoint network in-profile packets/octets forwarded from the adapter card specified in the show mda command towards the fabric, then to the output destination adapter card <sup>1</sup>                         |
|                                        | Network In Profile dropped: the number of multipoint network in-profile packets/octets dropped from the adapter card specified in the show mda command towards the fabric, then to the output destination adapter card <sup>1</sup>                             |
|                                        | Network Out Profile forwarded: the number of multipoint network out-of-profile packets/octets forwarded from the adapter card specified in the show mda command towards the fabric, then to the output destination adapter card <sup>1</sup>                    |
|                                        | Network Out Profile dropped: the number of multipoint network out-of-profile packets/octets dropped from the adapter card specified in the show mda command towards the fabric, then to the output destination adapter card <sup>1</sup>                        |
|                                        | Access In Profile forwarded: the number of multipoint access in-profile packets/octets forwarded from the adapter card specified in the show mda command towards the fabric, then to the output destination adapter card <sup>1</sup>                           |
|                                        | Access Out Profile forwarded: the number of multipoint access out-of-profile packets/octets forwarded from the adapter card specified in the show mda command towards the fabric, then to the output destination adapter card <sup>1</sup>                      |
|                                        | Access dropped: the number of multipoint access out-of-profile packets/octets and access in-profile packets/octets dropped from the adapter card specified in the show mda command towards the fabric, then to the output destination adapter card <sup>1</sup> |
| Total Network forwarded Packets/Octets | The number of network in-profile and out-of-profile packets/octets forwarded                                                                                                                                                                                    |

**Table 38 Show MDA Fabric Statistics Output Fields (Continued)**

| Label                                     | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Total Network dropped Packets/<br>Octets  | The number of network in-profile and out-of-profile packets/octets dropped                                                                                                                                                                                                                                                                                                                                                                                 |
| Total Access forwarded Packets/<br>Octets | The number of access in-profile and out-of-profile packets/octets forwarded                                                                                                                                                                                                                                                                                                                                                                                |
| Total Access dropped Packets/<br>Octets   | The number of access in-profile and out-of-profile packets/octets dropped                                                                                                                                                                                                                                                                                                                                                                                  |
| Statistic of Destination MDA              | If the dest-mds keyword is specified in the show statistics command, displays the network and access ingress statistics from all source adapter cards going towards the fabric and destined for the specified adapter card. Global fabric statistics are also displayed, as well as the fabric port statistics if the destination adapter card has the collection of fabric statistics enabled. The sum of traffic forwarded or dropped is also displayed. |
| Drop Events                               | The number of packets that are dropped from the buffer at the 7705 SAR-8 or 7705 SAR-18 adapter card port instead of being transferred to the fabric. Drop events only occur if an excessive amount of traffic is flowing through the ports, which causes the buffers to fill up; under normal circumstances, this statistic should always be 0.                                                                                                           |

**Table 38 Show MDA Fabric Statistics Output Fields (Continued)**

| Label                                          | Description                                                                                                                                                                                                                                  |
|------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Unicast from Source MDA Packets/Octets         | Network In Profile forwarded: the number of network in-profile packets/octets forwarded from any source adapter card toward the fabric, then to the destination adapter card specified in the show mda command <sup>2</sup>                  |
|                                                | Network In Profile dropped: the number of network in-profile packets/octets dropped from any source adapter card toward the fabric, then to the destination adapter card specified in the show mda command <sup>2</sup>                      |
|                                                | Network Out Profile forwarded: the number of network out-of-profile packets/octets forwarded from any source adapter card toward the fabric, then to the destination adapter card specified in the show mda command <sup>2</sup>             |
|                                                | Network Out Profile dropped: the number of network out-of-profile packets/octets dropped from any source adapter card toward the fabric, then to the destination adapter card specified in the show mda command <sup>2</sup>                 |
|                                                | Access In Profile forwarded: the number of access in-profile packets/octets forwarded from any source adapter card toward the fabric, then to the destination adapter card specified in the show mda command <sup>2</sup>                    |
|                                                | Access Out Profile forwarded: the number of access out-of-profile packets/octets forwarded from any source adapter card toward the fabric, then to the destination adapter card specified in the show mda command <sup>2</sup>               |
|                                                | Access dropped: the number of access in-profile packets/octets and out-of-profile packets/octets dropped from any source adapter card toward the fabric, then to the destination adapter card specified in the show mda command <sup>2</sup> |
| Total Unicast Network forwarded Packets/Octets | The number of unicast network in-profile and out-of-profile packets/octets forwarded                                                                                                                                                         |
| Total Unicast Network dropped Packets/Octets   | The number of unicast network in-profile and out-of-profile packets/octets dropped                                                                                                                                                           |
| Total Unicast Access forwarded Packets/Octets  | The number of unicast access in-profile and out-of-profile packets/octets forwarded                                                                                                                                                          |

**Table 38 Show MDA Fabric Statistics Output Fields (Continued)**

| Label                                           | Description                                                                                                                                                                                                                                                                                                       |
|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Total Unicast Access dropped Packets/Octets     | The number of unicast access in-profile and out-of-profile packets/octets dropped                                                                                                                                                                                                                                 |
| Fabric Global Stats Packets/Octets <sup>3</sup> | If the dest-mds keyword is specified in the show mda statistics command, displays the global fabric statistics collected from the fabric. The statistics include all traffic switched over the fabric, which includes traffic to all adapter cards and all internal traffic such as traffic destined for the CSM. |
|                                                 | Unicast Forwarded: the number of forwarded unicast packets/octets switched over the fabric                                                                                                                                                                                                                        |
|                                                 | Multicast Forwarded: the number of forwarded multicast packets/octets switched over the fabric                                                                                                                                                                                                                    |
|                                                 | Total Forwarded: the total number of forwarded packets/octets switched over the fabric                                                                                                                                                                                                                            |
|                                                 | Total Dropped: the total number of dropped packets/octets switched over the fabric                                                                                                                                                                                                                                |

**Notes:**

1. Destination MDA 1/x in the output field, where x = 1 to 6 on the 7705 SAR-8 and 1 to 12 and X1 to X4 on the 7705 SAR-18.
2. Source MDA 1/x in the output field, where x = 1 to 6 on the 7705 SAR-8 and 1 to 12 and X1 to X4 on the 7705 SAR-18.
3. Fabric Global Stats octet counts are supported only on the 7705 SAR-18. For other 7705 SAR products, "N/A" is displayed in these fields.



**Output Example (ip-transport statistics)**

The following example shows an MDA fabric statistics display when the **ip-transport** keyword is used. The keyword applies only to the 7705 SAR-8 and 7705 SAR-18.

```
*A:ALU-1># show mda 1/1 statistics ip-transport
=====
IP Transport Statistics
=====

IP Transport Queue Statistics

Network Ingress Queue Packets Bytes
 Forwarded : 99 34238
 Dropped : 0 0
Access Ingress Queue Packets Bytes
 Forwarded : 50 29250
 Dropped : 0 0

Serial Socket Queue Statistics

Access Ingress Queue Packets Bytes
 Forwarded : 0 0
 Dropped : 0 0
=====
```

**Table 39 Show MDA Fabric IP-Transport Statistics Output Fields**

| Label                                         | Description                                                                                                    |
|-----------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| <b>IP Transport Statistics</b>                |                                                                                                                |
| <b>IP Transport Queue Statistics</b>          |                                                                                                                |
| Network Ingress Queue<br>Forwarded<br>Dropped | The number of IP-Transport subservice network ingress queued packets and bytes that were forwarded and dropped |
| Access Ingress Queue<br>Forwarded<br>Dropped  | The number of IP-Transport subservice access ingress queued packets and bytes that were forwarded and dropped  |
| <b>Serial Socket Queue Statistics</b>         |                                                                                                                |
| Access Ingress Queue<br>Forwarded<br>Dropped  | The number of serial raw socket access ingress queued packets and bytes that were forwarded and dropped        |

### Output Example (mirror statistics)

The following example shows an MDA fabric statistics display when the **mirror** keyword is used. The **statistics mirror** keywords apply only to the 7705 SAR-8, 7705 SAR-18, and 7705 SAR-X. The **aggregate-statistics mirror** keywords apply only to the 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-M, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-W, and 7705 SAR-Wx. Refer to the “Mirroring” chapter in the 7705 SAR OAM and Diagnostics Guide for more information on mirroring.

```
*A:ALU-1# show mda 1/1 statistics mirror
=====
mirror Statistics
=====

mirror Queue Statistics

```

| Mirror Queue 1 Best-effort | Packets | Bytes |
|----------------------------|---------|-------|
| In Profile forwarded :     | 0       | 0     |
| In Profile dropped :       | 0       | 0     |
| Out Profile forwarded :    | 0       | 0     |
| Out Profile dropped :      | 0       | 0     |
| Mirror Queue 2 Best-effort | Packets | Bytes |
| In Profile forwarded :     | 0       | 0     |
| In Profile dropped :       | 0       | 0     |
| Out Profile forwarded :    | 0       | 0     |
| Out Profile dropped :      | 0       | 0     |
| Mirror Queue 3 Best-effort | Packets | Bytes |
| In Profile forwarded :     | 0       | 0     |
| In Profile dropped :       | 0       | 0     |
| Out Profile forwarded :    | 0       | 0     |
| Out Profile dropped :      | 0       | 0     |
| Mirror Queue 4 Best-effort | Packets | Bytes |
| In Profile forwarded :     | 0       | 0     |
| In Profile dropped :       | 0       | 0     |
| Out Profile forwarded :    | 0       | 0     |
| Out Profile dropped :      | 0       | 0     |
| Mirror Queue 5 Expedited   | Packets | Bytes |
| In Profile forwarded :     | 0       | 0     |
| In Profile dropped :       | 0       | 0     |
| Out Profile forwarded :    | 0       | 0     |
| Out Profile dropped :      | 0       | 0     |
| Mirror Queue 6 Expedited   | Packets | Bytes |
| In Profile forwarded :     | 0       | 0     |
| In Profile dropped :       | 0       | 0     |
| Out Profile forwarded :    | 0       | 0     |
| Out Profile dropped :      | 0       | 0     |
| Mirror Queue 7 Expedited   | Packets | Bytes |
| In Profile forwarded :     | 0       | 0     |
| In Profile dropped :       | 0       | 0     |
| Out Profile forwarded :    | 0       | 0     |
| Out Profile dropped :      | 0       | 0     |
| Mirror Queue 8 Expedited   | Packets | Bytes |
| In Profile forwarded :     | 0       | 0     |
| In Profile dropped :       | 0       | 0     |
| Out Profile forwarded :    | 0       | 0     |
| Out Profile dropped :      | 0       | 0     |

```
=====
```

**Table 40 Show MDA Fabric Mirror Statistics Output Fields**

| Label                                                  | Description                                                                                               |
|--------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| <b>Mirror Queue Statistics for Mirror Queue 1 to 4</b> |                                                                                                           |
| In Profile forwarded                                   | The number of packets and octets forwarded by the mirror queue for in-profile and best-effort traffic     |
| In Profile dropped                                     | The number of packets and octets dropped by the mirror queue for in-profile and best-effort traffic       |
| Out Profile forwarded                                  | The number of packets and octets forwarded by the mirror queue for out-of-profile and best-effort traffic |
| Out Profile dropped                                    | The number of packets and octets dropped by the mirror queue for out-of-profile and best-effort traffic   |
| <b>Mirror Queue Statistics for Mirror Queue 5 to 8</b> |                                                                                                           |
| In Profile forwarded                                   | The number of packets and octets forwarded by the mirror queue for in-profile and expedited traffic       |
| In Profile dropped                                     | The number of packets and octets dropped by the mirror queue for in-profile and expedited traffic         |
| Out Profile forwarded                                  | The number of packets and octets forwarded by the mirror queue for out-of-profile and expedited traffic   |
| Out Profile dropped                                    | The number of packets and octets dropped by the mirror queue for out-of-profile and expedited traffic     |

**Output Example (security encryption)**

The following example shows an MDA fabric statistics display when the **security encryption** keywords are used. The **security encryption** keywords apply only to the 7705 SAR-18 and 7705 SAR-8 (with CSMv2). Refer to the “IPSec” section in the 7705 SAR Services Guide for more information on IPSec security.

```
*A:ALU-1# show mda 1/1 statistics security encryption
=====
MDA 1/1 Security Statistics
=====

IPsec Datapath Statistics

Encrypted packets : 382893273
Encrypted bytes : 187617703770
Outbound dropped packets : 130532
Outbound SA misses : 130532
Outbound policy entry misses : 0
Decrypted packets : 382878423
Decrypted bytes : 187610427270
Inbound dropped packets : 0
Inbound SA misses : 0
Inbound IP dst/src mismatches : 0
Transmit packet errors : 0
Drop Too Big/Df-set Pkts : 0

IPsec Control Statistics (System Wide)

Static IPsec Tunnels : 1
Dynamic IPsec Tunnels : 0

IPsec Queue Statistics

Decryption Queue Best-effort Packets Bytes
Hi Priority forwarded : 0 0
Hi Priority dropped : 0 0
Low Priority forwarded : 383236465 2018336468
Low Priority dropped : 0 0
Decryption Queue Expedited Packets Bytes
Hi Priority forwarded : 0 0
Hi Priority dropped : 0 0
Low Priority forwarded : 0 0
Low Priority dropped : 0 0
Encryption Queue Best-effort Packets Bytes
In Profile forwarded : 0 0
In Profile dropped : 0 0
Out Profile forwarded : 383494130 3228529972
Out Profile dropped : 0 0
Encryption Queue Expedited Packets Bytes
In Profile forwarded : 0 0
In Profile dropped : 0 0
Out Profile forwarded : 0 0
Out Profile dropped : 0 0
Encryption Queue CTL Packets Bytes
Forwarded : 0 0
Dropped : 0 0
=====
```

**Table 41 Show MDA Fabric Security Encryption Statistics Output Fields**

| Label                                         | Description                                                                                                                                  |
|-----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>IPsec Datapath Statistics</b>              |                                                                                                                                              |
| Encrypted packets                             | The total number of packets encrypted by the adapter card to be sent out IPsec tunnels                                                       |
| Encrypted bytes                               | The total number of bytes encrypted by the adapter card to be sent out IPsec tunnels                                                         |
| Outbound dropped packets                      | The total number of outbound packets dropped instead of encrypted and sent out IPsec tunnels                                                 |
| Outbound SA misses                            | The number of Security Association-related mismatches in the outbound direction                                                              |
| Outbound policy entry misses                  | The number of security policy entry mismatches in the outbound direction                                                                     |
| Decrypted packets                             | The total number of decrypted packets                                                                                                        |
| Decrypted bytes                               | The total number of decrypted bytes                                                                                                          |
| Inbound dropped packets                       | The total number packets dropped instead of forwarded                                                                                        |
| Inbound SA misses                             | The number of inbound Security Association-related misses (that is, having mismatched security parameter index (SPI) on manual keyed tunnel) |
| Inbound IP dst/src mismatches                 | The number of security policy entry mismatches in the inbound direction due to IP destination or source address mismatches                   |
| Transmit packet errors                        | The number of generic packet transmit errors                                                                                                 |
| Drop Too Big/Df-set Pkts                      | The number of packets dropped because the packet is too big and the do-not-fragment flag is set                                              |
| <b>IPsec Control Statistics (System Wide)</b> |                                                                                                                                              |
| Static IPsec Tunnels                          | The number of static IPsec tunnels configured on the 7705 SAR                                                                                |
| Dynamic IPsec Tunnels                         | Not applicable (always 0)                                                                                                                    |
| <b>Encryption/Decryption Queue Statistics</b> |                                                                                                                                              |
| <b>Decryption Queue Best-effort</b>           |                                                                                                                                              |
| Hi Priority forwarded                         | The number of packets and octets forwarded by the decryption queue for high priority and best effort traffic                                 |

**Table 41 Show MDA Fabric Security Encryption Statistics Output Fields**

| Label                               | Description                                                                                                   |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------|
| Hi Priority dropped                 | The number of packets and octets dropped by the decryption queue for high priority and best effort traffic    |
| Low Priority forwarded              | The number of packets and octets forwarded by the decryption queue for low priority and best effort traffic   |
| Low Priority dropped                | The number of packets and octets dropped by the decryption queue for low priority and best effort traffic     |
| <b>Decryption Queue Expedited</b>   |                                                                                                               |
| Hi Priority forwarded               | The number of packets and octets forwarded by the decryption queue for high priority and expedited traffic    |
| Hi Priority dropped                 | The number of packets and octets dropped by the decryption queue for high priority and expedited traffic      |
| Low Priority forwarded              | The number of packets and octets forwarded by the decryption queue for low priority and expedited traffic     |
| Low Priority dropped                | The number of packets and octets dropped by the decryption queue for low priority and expedited traffic       |
| <b>Encryption Queue Best-effort</b> |                                                                                                               |
| In Profile forwarded                | The number of packets and octets forwarded by the encryption queue for in-profile and best effort traffic     |
| In Profile dropped                  | The number of packets and octets dropped by the encryption queue for in-profile and best effort traffic       |
| Out Profile forwarded               | The number of packets and octets forwarded by the encryption queue for out-of-profile and best effort traffic |
| Out Profile dropped                 | The number of packets and octets dropped by the encryption queue for out-of-profile and best effort traffic   |
| <b>Encryption Queue Expedited</b>   |                                                                                                               |
| In Profile forwarded                | The number of packets and octets forwarded by the encryption queue for in-profile and expedited traffic       |
| In Profile dropped                  | The number of packets and octets dropped by the encryption queue for in-profile and expedited traffic         |
| Out Profile forwarded               | The number of packets and octets forwarded by the encryption queue for out-of-profile and expedited traffic   |
| Out Profile dropped                 | The number of packets and octets dropped by the encryption queue for out-of-profile and expedited traffic     |

**Table 41 Show MDA Fabric Security Encryption Statistics Output Fields**

| Label                       | Description                                                                                 |
|-----------------------------|---------------------------------------------------------------------------------------------|
| <b>Encryption Queue CTL</b> |                                                                                             |
| Forwarded                   | The number of packets and octets forwarded by the encryption queue for control path traffic |
| Dropped                     | The number of packets and octets dropped by the encryption queue for control path traffic   |

**Output Example (security firewall)**

The following example shows an MDA fabric statistics display when the **security firewall** keywords are used. The **security firewall** keywords apply only to the 7705 SAR-18 and 7705 SAR-8 (with CSMv2). Refer to the “Security Parameters” section in the 7705 SAR Router Configuration Guide for more information on firewall security.

```
*A:ALU-1# show mda 1/6 statistics security firewall
=====
Firewall Statistics
=====

Firewall Queue Statistics

Network Queue 1 Best-effort Packets Bytes
 In Profile forwarded : 0 0
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
Network Queue 2 Expedited Packets Bytes
 In Profile forwarded : 0 0
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
Access Queue 1 Best-effort Packets Bytes
 In Profile forwarded : 0 0
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
Access Queue 2 Expedited Packets Bytes
 In Profile forwarded : 0 0
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
=====
```

**Table 42 Show MDA Fabric Security Firewall Statistics Output Fields**

| Label                       | Description                                                                                 |
|-----------------------------|---------------------------------------------------------------------------------------------|
| Network Queue 1 Best-effort | The statistics for the best-effort network queue; queue 1 is always for best-effort traffic |

**Table 42 Show MDA Fabric Security Firewall Statistics Output Fields**

| Label                      | Description                                                                                                         |
|----------------------------|---------------------------------------------------------------------------------------------------------------------|
| Network Queue 2 Expedited  | The statistics for the expedited network queue; queue 2 is always for expedited traffic                             |
| Access Queue 1 Best-effort | The statistics for the best-effort access queue; queue 1 is always for best-effort traffic                          |
| Access Queue 2 Best-effort | The statistics for the expedited access queue; queue 2 is always for expedited traffic                              |
| In Profile forwarded       | The number of packets and bytes forwarded by the security queue for in-profile best-effort or expedited traffic     |
| In Profile dropped         | The number of packets and bytes dropped by the security queue for in-profile best-effort or expedited traffic       |
| Out Profile forwarded      | The number of packets and bytes forwarded by the security queue for out-of-profile best-effort or expedited traffic |
| Out Profile dropped        | The number of packets and bytes dropped by the security queue for out-of-profile best-effort or expedited traffic   |

**Output Example**

The following example shows an MDA fabric statistics display if the **with-fabric-stats** keyword is used.

```
*A:ALU-1# show mda with-fabric-stats
=====
Summary of MDA's With Fabric Stats Enabled
=====
Slot Mda Provisioned Type Admin Operational
 Mda Equipped Type (if different) State State

1 1 a12-sdiv2 down provisioned
=====
*A:ALU-1>#
```

**Table 43 Show MDA With Fabric Statistics Output Fields**

| Label                        | Description                                                                                 |
|------------------------------|---------------------------------------------------------------------------------------------|
| Slot                         | The card slot number (always 1)                                                             |
| Mda                          | The adapter card slot number                                                                |
| Provisioned Type             | The provisioned adapter card type                                                           |
| Equipped Type (if different) | The adapter card type actually installed in the slot if different from the provisioned type |



**Table 43 Show MDA With Fabric Statistics Output Fields (Continued)**

| Label             | Description                                                                                                                                                                                                                                  |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Admin State       | up: the adapter card is administratively up<br>down: the adapter card is administratively down                                                                                                                                               |
| Operational State | up: the adapter card is operationally up<br>down: the adapter card is operationally down<br>provisioned: there is no adapter card in the slot but it has been preconfigured<br>failed: the provisioned adapter card has operationally failed |

**Output Example**

The following example shows aggregate statistics for access and network ingress fabric traffic on the 7705 SAR-M when the **aggregate-statistics** keyword is used. The displays on the 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-W, 7705 SAR-Wx, 7705 SAR-H, and 7705 SAR-Hc look similar. Additionally, on the 7705 SAR-Ax, 7705 SAR-W, 7705 SAR-Wx, 7705 SAR-H, and 7705 SAR-Hc, the displays include IPsec security statistics. Refer to the “IPsec” section in the 7705 SAR Services Guide for more information on IPsec security. On the 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-Ax and 7705 SAR-Wx, the displays include the aggregated firewall security statistics. On the 7705 SAR-H and 7705 SAR-Hc, the displays include IP transport statistics.

```
*A:ALU-1># show mda aggregate-statistics
=====
Drop Events: 0
=====

Unicast from All MDA's to MDA 1/1 Packets Octets
Network In Profile forwarded : 0 0
Network In Profile dropped : 0 0
Network Out Profile forwarded: 0 0
Network Out Profile dropped : 0 0
Access In Profile forwarded : 0 0
Access Out Profile forwarded : 6592860 6724717200
Access dropped : 1070278 1093824116
Unicast from All MDA's to MDA 1/2 Packets Octets

Network In Profile forwarded : 0 0
Network In Profile dropped : 0 0
Network Out Profile forwarded: 0 0
Network Out Profile dropped : 0 0
Access In Profile forwarded : 0 0
Access Out Profile forwarded : 0 0
Access dropped : 0 0

Unicast from All MDA's to MDA 1/3 Packets Octets
Network In Profile forwarded : 0 0
Network In Profile dropped : 0 0
```

```

Network Out Profile forwarded: 0 0
Network Out Profile dropped : 0 0
Access In Profile forwarded : 0 0
Access Out Profile forwarded : 0 0
Access dropped : 0 0

Multicast from All MDA's Packets Octets
Network In Profile forwarded : 0 0
Network In Profile dropped : 0 0
Network Out Profile forwarded: 0 0
Network Out Profile dropped : 0 0
Access In Profile forwarded : 0 0
Access Out Profile forwarded : 0 0
Access dropped : 0 0

Total Network forwarded : 0 0
Total Network dropped : 0 0
Total Access forwarded : 6592860 6724717200
Total Access dropped : 1070278 1093824116
=====
*A:ALU-1>#

```

The following example shows the inclusion of IPSec security statistics on 7705 SAR-Ax, 7705 SAR-W, 7705 SAR-Wx, 7705 SAR-H, and 7705 SAR-Hc displays.

```

*A:ALU-1# show mda aggregate-statistics
=====
Aggregated Statistics
=====
Drop Events : 0

Unicast from All MDA's to MDA 1/1 Packets Octets
Network In Profile forwarded : 0 0
Network In Profile dropped : 0 0
Network Out Profile forwarded: 0 0
Network Out Profile dropped : 0 0
Access In Profile forwarded : 0 0
Access Out Profile forwarded : 0 0
Access dropped : 0 0
Multicast from All MDA's Packets Octets
Network In Profile forwarded : 0 0
Network In Profile dropped : 0 0
Network Out Profile forwarded: 0 0
Network Out Profile dropped : 0 0
Access In Profile forwarded : 0 0
Access Out Profile forwarded : 0 0
Access dropped : 0 0

Total Network forwarded : 0 0
Total Network dropped : 0 0
Total Access forwarded : 0 0
Total Access dropped : 0 0
=====

```

```

Aggregated Security Statistics
=====

IPsec Datapath Statistics

 Encrypted packets : 2114116
 Encrypted bytes : 2997816488
 Outbound dropped packets : 1928
 Outbound SA misses : 1928
 Outbound policy entry misses : 0
 Decrypted packets : 2104241
 Decrypted bytes : 2983813738
 Inbound dropped packets : 207
 Inbound SA misses : 207
 Inbound IP dst/src mismatches : 0
 Inbound IP fragmented packets : 0
 Transmit packet errors : 0
 Drop Too Big/Df-set Pkts : 0

IPsec Control Statistics (System Wide)

 Static IPsec Tunnels : 4
 Dynamic IPsec Tunnels : 0

IPsec Queue Statistics

Decryption Queue Best-effort Packets Bytes
 Hi Priority forwarded : 0 0
 Hi Priority dropped : 0 0
 Low Priority forwarded : 2105076 3056570352
 Low Priority dropped : 0 0

Decryption Queue Expedited Packets Bytes
 Hi Priority forwarded : 0 0
 Hi Priority dropped : 0 0
 Low Priority forwarded : 0 0
 Low Priority dropped : 0 0

Encryption Queue Best-effort Packets Bytes
 In Profile forwarded : 893166 1266509388
 In Profile dropped : 0 0
 Out Profile forwarded : 1221786 1732492548
 Out Profile dropped : 0 0

Encryption Queue Expedited Packets Bytes
 In Profile forwarded : 0 0
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0

Encryption Queue CTL Packets Bytes
 Forwarded : 0 0
 Dropped : 0 0
=====
*A:ALU-1#

```

The following example shows the inclusion of aggregated firewall security statistics on the 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-Ax and 7705 SAR-Wx displays.

```
*A:ALU-1# show mda aggregate-statistics
=====
Aggregated Statistics
=====

Drop Events : 0

Unicast from All MDA's to MDA 1/1 Packets Octets
Network In Profile forwarded : 0 0
Network In Profile dropped : 0 0
Network Out Profile forwarded: 0 0
Network Out Profile dropped : 0 0
Access In Profile forwarded : 0 0
Access Out Profile forwarded : 0 0
Access dropped : 0 0
Multicast from All MDA's Packets Octets
Network In Profile forwarded : 0 0
Network In Profile dropped : 0 0
Network Out Profile forwarded: 0 0
Network Out Profile dropped : 0 0
Access In Profile forwarded : 0 0
Access Out Profile forwarded : 0 0
Access dropped : 0 0

Total Network forwarded : 0 0
Total Network dropped : 0 0
Total Access forwarded : 0 0
Total Access dropped : 0 0
=====
=====
Aggregated Security Statistics
=====

Group Encryption Datapath Statistics

Encrypted packets : 0
Encrypted bytes : 0
Outbound dropped packets : 0
Outbound unsupported uplink : 0
Outbound enqueue error : 0
Decrypted packets : 0
Decrypted bytes : 0
Inbound dropped packets : 0
Inbound invalid spi : 0
Inbound authentication failure: 0
Inbound padding error : 0
Inbound control word mismatch : 0
Inbound enqueue error : 0

Encryption/Decryption Queue Statistics

Decryption Queue Best-effort Packets Bytes
Hi Priority forwarded : 0 0
Hi Priority dropped : 0 0
Low Priority forwarded : 0 0
```

```

 Low Priority dropped : 0 0
Decryption Queue Expedited Packets Bytes
 Hi Priority forwarded : 0 0
 Hi Priority dropped : 0 0
 Low Priority forwarded : 0 0
 Low Priority dropped : 0 0
Encryption Queue Best-effort Packets Bytes
 In Profile forwarded : 0 0
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
Encryption Queue Expedited Packets Bytes
 In Profile forwarded : 0 0
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
Encryption Queue CTL Packets Bytes
 Forwarded : 0 0
 Dropped : 0 0

```

```

=====
Aggregated Firewall Statistics
=====

```

```

Firewall Queue Statistics

```

```

Network Queue 1 Best-effort Packets Bytes
 In Profile forwarded : 0 0
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
Network Queue 2 Expedited Packets Bytes
 In Profile forwarded : 0 0
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
Access Queue 1 Best-effort Packets Bytes
 Hi Priority forwarded : 0 0
 Hi Priority dropped : 0 0
 Low Priority forwarded : 0 0
 Low Priority dropped : 0 0
Access Queue 2 Expedited Packets Bytes
 Hi Priority forwarded : 0 0
 Hi Priority dropped : 0 0
 Low Priority forwarded : 0 0
 Low Priority dropped : 0 0

```

```

=====
Aggregated Mirror Queue Statistics
=====

```

```

Mirror Queue 1 Packets Bytes
 In Profile forwarded : 0 0
 In Profile dropped : 0 0
 Out Profile forwarded : 5600 4481226
 Out Profile dropped : 0 0
Mirror Queue 2 Packets Bytes
 In Profile forwarded : 0 0
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0

```

```

 Out Profile dropped : 0 0
Mirror Queue 3 Packets Bytes
 In Profile forwarded : 0 0
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
Mirror Queue 4 Packets Bytes
 In Profile forwarded : 0 0
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
Mirror Queue 5 Packets Bytes
 In Profile forwarded : 0 0
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
Mirror Queue 6 Packets Bytes
 In Profile forwarded : 0 0
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
Mirror Queue 7 Packets Bytes
 In Profile forwarded : 0 0
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
Mirror Queue 8 Packets Bytes
 In Profile forwarded : 0 0
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0

```

```
=====
```

The following example shows the inclusion of IP transport statistics on the 7705 SAR-H and 7705 SAR-Hc displays.

```

=====
Aggregated IP Transport Statistics
=====

IP Transport Queue Statistics

Network Ingress Queue Packets Bytes
 Forwarded : 101 35450
 Dropped : 0 0
Access Ingress Queue Packets Bytes
 Forwarded : 48 28080
 Dropped : 0 0

Serial Socket Queue Statistics

Access Ingress Queue Packets Bytes
 Forwarded : 98 54586
 Dropped : 0 0
=====

```

**Table 44 Show MDA Aggregate Statistics Output Fields**

| Label                                                        | Description                                                                                                                                                                                                                                                                                               |
|--------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Drop Events                                                  | The number of packets that are dropped from the buffer at the port instead of being transferred to the fabric. Drop events only occur if an excessive amount of traffic is flowing through the ports, which causes the buffers to fill up; under normal circumstances, this statistic should always be 0. |
| Unicast from all MDA's to Destination MDA Packets/<br>Octets | Network In Profile forwarded: number of network in-profile packets/octets forwarded from any source adapter card toward the fabric, then to the destination adapter card specified in the show mda command                                                                                                |
|                                                              | Network In Profile dropped: number of network in-profile packets/octets dropped from any source adapter card toward the fabric, then to the destination adapter card specified in the show mda command                                                                                                    |
|                                                              | Network Out Profile forwarded: number of network out-of-profile packets/octets forwarded from any source adapter card toward the fabric, then to the destination adapter card specified in the show mda command                                                                                           |
|                                                              | Network Out Profile dropped: the number of network out-of-profile packets/octets dropped from any source adapter card toward the fabric, then to the destination adapter card specified in the show mda command                                                                                           |
|                                                              | Access In Profile forwarded: number of access in-profile packets/octets forwarded from any source adapter card toward the fabric, then to the destination adapter card specified in the show mda command                                                                                                  |
|                                                              | Access Out Profile forwarded: the number of access out-of-profile packets/octets forwarded from any source adapter card toward the fabric, then to the destination adapter card specified in the show mda command                                                                                         |
|                                                              | Access dropped: the number of access packets/octets dropped from any source adapter card toward the fabric, then to the destination adapter card specified in the show mda command                                                                                                                        |

**Table 44 Show MDA Aggregate Statistics Output Fields (Continued)**

| Label                                   | Description                                                                                                                                                                                                                 |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Multicast from All MDA's Packets/Octets | Network In Profile forwarded: number of multicast network in-profile packets/octets forwarded from any source adapter card toward the fabric, then to the destination adapter card specified in the show mda command        |
|                                         | Network In Profile dropped: number of multicast network in-profile packets/octets dropped from any source adapter card toward the fabric, then to the destination adapter card specified in the show mda command            |
|                                         | Network Out Profile forwarded: number of multicast network out-of-profile packets/octets forwarded from any source adapter card toward the fabric, then to the destination adapter card specified in the show mda command   |
|                                         | Network Out Profile dropped: the number of multicast network out-of-profile packets/octets dropped from any source adapter card toward the fabric, then to the destination adapter card specified in the show mda command   |
|                                         | Access In Profile forwarded: number of multicast access in-profile packets/octets forwarded from any source adapter card toward the fabric, then to the destination adapter card specified in the show mda command          |
|                                         | Access Out Profile forwarded: the number of multicast access out-of-profile packets/octets forwarded from any source adapter card toward the fabric, then to the destination adapter card specified in the show mda command |
|                                         | Access dropped: the number of multicast access packets/octets dropped from any source adapter card toward the fabric, then to the destination adapter card specified in the show mda command                                |
| Total Network forwarded Packets/Octets  | The number of network in-profile and out-of-profile packets/octets forwarded                                                                                                                                                |
| Total Network dropped Packets/Octets    | The number of network in-profile and out-of-profile packets/octets dropped                                                                                                                                                  |
| Total Access forwarded Packets/Octets   | The number of access in-profile and out-of-profile packets/octets forwarded                                                                                                                                                 |



**Table 44 Show MDA Aggregate Statistics Output Fields (Continued)**

| Label                                                                                           | Description                                                                                                    |
|-------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| Total Access dropped Packets/<br>Octets                                                         | The number of access in-profile and out-of-profile packets/octets dropped                                      |
| <b>Aggregated Security Statistics</b> See <a href="#">Table 40</a> and <a href="#">Table 41</a> |                                                                                                                |
| <b>Aggregated IP Transport Statistics</b>                                                       |                                                                                                                |
| <b>IP Transport Queue Statistics</b>                                                            |                                                                                                                |
| Network Ingress Queue<br>Forwarded<br>Dropped                                                   | The number of IP-Transport subservice network ingress queued packets and bytes that were forwarded and dropped |
| Access Ingress Queue<br>Forwarded<br>Dropped                                                    | The number of IP-Transport subservice access ingress queued packets and bytes that were forwarded and dropped  |
| <b>Serial Socket Queue Statistics</b>                                                           |                                                                                                                |
| Access Ingress Queue<br>Forwarded<br>Dropped                                                    | The number of serial raw socket access ingress queued packets and bytes that were forwarded and dropped        |

## fdb

**Syntax** **fdb** [**mac** *ieee-address*] [**port** *port-id*] [**all**]

**Context** show>mda>ring

**Description** This command displays the forwarding database (FDB) for the specified MAC address or ring port, or all FDBs associated with the specified ring adapter card.

**Parameters** *ieee-address* — displays the FDB associated with the specified MAC address  
*port-id* — displays the FDB associated with the specified port, where the port is a ring port or the v-port  
**all** — displays all FDBs associated with the ring adapter card

**Output** The following output is an example of FDB information, and [Table 45](#) describes the fields.

**Output Example**

```
*A:7705:Dut-A# show mda 1/2 ring fdb port 1/11/1
=====
Ring MDA Forwarding Database for 1/11/1
=====
```

```

MAC Port Type

38:52:1a:f4:1f:cd 1/11/1 Host

No. of Entries: 1

Learning Enabled.

Ageing Enabled.

Remote age time = 900

Discard unknown source Disabled.

Table Size = 512

High water Mark = 95

1/2/1, Mac pinning Disabled.
1/2/2, Mac pinning Disabled.
=====

```

```
*A:7705:Dut-A# show mda 1/2 ring fdb port 1/11/v-port
```

```
=====
Ring MDA Forwarding Database for 1/11/v-port
=====
```

```

MAC Port Type

38:52:1a:f4:1f:cf 1/11/v-port Host

No. of Entries: 1

Learning Enabled.

Ageing Enabled.

Remote age time = 900

Discard unknown source Disabled.

Table Size = 512

High water Mark = 95

1/2/1, Mac pinning Disabled.
1/2/2, Mac pinning Disabled.
=====

```

```
*A:7705:Dut-A# show mda 1/11 ring fdb all
```

```
=====
Ring MDA Forwarding Database
=====
```

```

MAC Port Type

38:52:1a:f4:1f:cd 1/11/1 Host
38:52:1a:f4:1f:ce 1/11/2 Host
38:52:1a:f4:1f:cf 1/11/v-port Host
38:52:1a:f4:20:e9 1/11/2 Dynamic

```

```

No. of Entries: 4

Learning Enabled.

Ageing Enabled.

Remote age time = 900

Discard unknown source Disabled.

Table Size = 512

High water Mark = 95

1/2/1, Mac pinning Disabled.
1/2/2, Mac pinning Disabled.
=====

```

**Table 45** Show MDA Ring FDB Output Fields

| Label                               | Description                                                                                                                     |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| <b>Ring MDA Forwarding Database</b> |                                                                                                                                 |
| MAC                                 | The MAC address of any matching entry                                                                                           |
| Port                                | The port identifier of any matching entry                                                                                       |
| Type                                | The type of matching entry                                                                                                      |
| No. of Entries:                     | The total number of MAC addresses currently in all FDBs on the adapter card, which includes host, static, and dynamic addresses |
| Learning:                           | The configured state of the learning capabilities: Enabled or Disabled                                                          |
| Ageing:                             | The configured state of the aging capabilities: Enabled or Disabled                                                             |
| Remote age time                     | The age time setting of the remote device, in seconds                                                                           |
| Discard unknown source:             | The configured state of the discard capability for packets arriving from an unknown source: Enabled or Disabled                 |
| Table Size                          | The table size of the dynamic FDB table                                                                                         |
| High water Mark                     | The high-water mark setting for the FDB table, in percentage of table-size                                                      |
| 1/mda/port, Mac pinning Disabled.   | The configured state of the MAC pinning capability: Enabled or Disabled                                                         |

### 3.14.2.1.3 Show External Alarms Commands

#### external-alarms

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>external-alarms alarm</b> [ <i>alarm-id</i> ]<br><b>external-alarms input</b> [ <i>alarm-input</i> ] [ <b>detail</b> ]<br><b>external-alarms name</b> [ <i>name-string</i> ] [ <b>detail</b> ]<br><b>external-alarms output</b> [ <i>alarm-output</i> ] [ <b>detail</b> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Context</b>     | show                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b> | This command displays external alarm information for 7705 SAR Ethernet ports, for the Auxiliary Alarm card, or the External Alarms connector on the Fan module of the 7705 SAR-8, the Alarm module of the 7705 SAR-18, or the faceplate of the 7705 SAR-M, 7705 SAR-X, 7705 SAR-H, or 7705 SAR-Hc chassis.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Parameters</b>  | <i>alarm-id</i> — the alarm identifier<br><b>Values</b> 1 to 2147483647<br><i>alarm-input</i> — identifies the alarm input <ul style="list-style-type: none"> <li>for Ethernet ports, the format is:<br/> <b>port-slot/mda/port</b> [<i>name</i>]</li> <li>for the Auxiliary Alarm card, the format is:<br/> <b>alarm-slot/mda.{d   a}-alarm-num</b> [<i>name</i>]</li> <li>for the four alarm inputs on an External Alarms connector, the format is:<br/> <b>alarm.d-alarm-num</b> [<i>name</i>]</li> </ul> where: <ul style="list-style-type: none"> <li><i>slot</i> = card slot number for IOM (always 1 on the 7705 SAR)</li> <li><i>mda</i> = Ethernet adapter card or Auxiliary Alarm card slot number (for Ethernet modules or ports on platforms with no card slots, the mda slot number is preconfigured)</li> <li><i>port</i> = port number for Ethernet ports</li> <li><b>d</b> = digital input</li> <li><b>a</b> = analog input</li> <li><i>alarm-num</i> = alarm port number (1 to 24 for digital on the Auxiliary Alarm card, 1 to 4 for digital on the four chassis alarm inputs, 1 or 2 for analog)</li> <li><i>name</i> = optional name assigned to the input</li> </ul> |



**Note:** If you configured a name for the alarm-input using the name option (see [input](#) command), you can use the configured name instead of the alarm-input identifier in the show command.

*name-string* — the name for the input port or output relay (maximum of 15 characters)

*alarm-output* — the output relay identifier, in the following format:

**relay-slot/mda.d-relay-num**

where:

*slot* = slot number of the card in the chassis (always 1 on the 7705 SAR)

*mda* = Auxiliary Alarm card slot number

**d** = digital output

*relay-num* = output relay number (1 to 8)



**Note:** If you configured a name for the alarm-output using the name option (see [output](#) command), you can use the configured name instead of the alarm-output identifier in the show command.

**detail** — displays detailed information for the external alarms

**Output** The following outputs are examples of external alarm information:

- Specific Alarm ([Output Example, Table 46](#))
- External Alarm Input ([Output Example, Table 47](#))
- External Alarm Input Detail ([Output Example, Table 48](#))
- External Alarm Output ([Output Example, Table 49](#))
- External Alarm Output Detail ([Output Example, Table 50](#))
- External Alarm Name ([Output Example, Table 51](#))

**Output Example**

```
*A:ALU-1># show>external-alarms# alarm 1
=====
Alarm 1 Detail
=====
Admin Status : up State : ok
Severity : critical
Description : N/A

Thresholds
 Analog Voltage : 0.000 V Operation : gt

Actions
 Log Alarm : yes
 Chassis Alarming : yes

Trigger Type Admin Value Threshold State

alarm-1/1.a-2 analog-in up 0.0 V ok

Triggers Req'd : any
=====
*A:ALU-1># show>#
```

**Table 46** Show Specific Alarm Fields

| Label             | Description                                                                                          |
|-------------------|------------------------------------------------------------------------------------------------------|
| Admin Status      | The administrative state of the alarm                                                                |
| State             | The current state of the alarm:<br>ghost: no trigger equipment presently installed                   |
|                   | ok: no triggers are detected                                                                         |
|                   | alarm detected: alarm is outstanding                                                                 |
|                   | not monitored: alarm or all triggers are administratively disabled                                   |
| Severity          | The severity level for the specified alarm                                                           |
| Description       | An optional description of the alarm                                                                 |
| <b>Thresholds</b> |                                                                                                      |
| Analog Voltage    | The analog voltage level threshold value for the specified alarm, in millivolts (0.000V)             |
| Operation         | The analog voltage level threshold operational value:<br>lt: a less-than value                       |
|                   | gt: a greater-than value                                                                             |
| <b>Actions</b>    |                                                                                                      |
| Log Alarm         | Indicates whether raise/clear log events and SNMP traps are generated for the specified alarm        |
| Chassis Alarming  | Indicates whether output to chassis alarm relays and LEDs are generated for the specified alarm      |
| Trigger           | The inputs that will trigger the alarm                                                               |
| Type              | The type of trigger (a digital input or analog input, or, for Ethernet ports, the operational state) |
| Admin             | The administrative state of the trigger                                                              |

**Table 46      Show Specific Alarm Fields (Continued)**

| Label           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Value           | <p>The current value of the alarm input:</p> <ul style="list-style-type: none"><li>• for a digital input — the state of the digital circuit associated with the trigger (open or closed).<br/>A value of open indicates that the external equipment has not shorted this digital input to one of the four common ground pins. If no external equipment is connected to a digital input on an Auxiliary Alarm card faceplate or External Alarm connector, all digital input ports read open.<br/>A value of closed indicates that the external equipment has shorted this digital input to one of the four common ground pins.</li><li>• for an analog input — the current voltage level of an analog trigger, in volts. If no external equipment is connected to the Auxiliary Alarm card faceplate or External Alarm connector, both analog inputs show no applied voltage (0.0V).</li><li>• for an Ethernet port — a value of down indicates an alarm event; a value of up indicates no alarm</li></ul> |
| Threshold State | The threshold state:<br>ghost: no threshold is present                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                 | not monitored: the threshold is administratively disabled                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                 | ok: the threshold is enabled                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                 | detected: the threshold has been crossed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Triggers Req'd  | The trigger condition that is required to raise an alarm:<br>any: any configured input trigger is required to raise an alarm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                 | all: all configured input triggers are required to raise an alarm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

**Output Example**

```

*A:ALU-1># show external-alarms input
=====
External Alarm Input Summary
=====
Input Id Name Type Admin Value Alarm State

alarm.d-1 digital-in up open ok
alarm.d-2 digital-in up open ok
alarm.d-3 digital-in up open ok
alarm.d-4 digital-in up open ok
port-1/2/1 oper-state up down alarm-detected
alarm-1/1.d-1 dd3 digital-in up open ok
alarm-1/1.d-2 digital-in up open ok
alarm-1/1.d-3 digital-in up open ok
alarm-1/1.d-4 digital-in up open ok
alarm-1/1.d-5 digital-in up open ok
alarm-1/1.d-6 digital-in up open ok
alarm-1/1.d-7 digital-in up open ok
alarm-1/1.d-8 digital-in up open ok
alarm-1/1.d-9 digital-in up open ok
alarm-1/1.d-10 digital-in up open ok
alarm-1/1.d-11 digital-in up open ok
alarm-1/1.d-12 digital-in up open ok
alarm-1/1.d-13 digital-in up open ok
alarm-1/1.d-14 digital-in up open ok
alarm-1/1.d-15 digital-in up open ok
alarm-1/1.d-16 digital-in up open ok
alarm-1/1.d-17 digital-in up open ok
alarm-1/1.d-18 digital-in up open ok
alarm-1/1.d-19 digital-in up open ok
alarm-1/1.d-20 digital-in up open ok
alarm-1/1.d-21 digital-in up open ok
alarm-1/1.d-22 digital-in up open ok
alarm-1/1.d-23 digital-in up open ok
alarm-1/1.d-24 digital-in up open ok
alarm-1/1.a-1 analog-in up 0.0 V ok
alarm-1/1.a-2 analog-in up 0.0 V ok
=====
*A:ALU-1># show>#

```



**Table 47** Show External Alarm Input Fields

| Label                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>External Alarm Input Summary</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Input Id                            | The alarm input identifier                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Name                                | The name of the alarm input                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Type                                | The type of input: digital, analog, or oper-state (for Ethernet ports)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Admin                               | The administrative state of the alarm input                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Value                               | <p>The current value of the alarm input:</p> <ul style="list-style-type: none"> <li>for a digital input — the state of the digital circuit associated with the trigger (open or closed).<br/>A value of open indicates that the external equipment has not shorted this digital input to one of the four common ground pins. If no external equipment is connected to a digital input on an Auxiliary Alarm card faceplate or External Alarm connector, all digital input ports read open.<br/>A value of closed indicates that the external equipment has shorted this digital input to one of the four common ground pins.</li> <li>for an analog input — the current voltage level of an analog trigger, in volts. If no external equipment is connected to the Auxiliary Alarm card faceplate or External Alarm connector, both analog inputs show no applied voltage (0.0V).</li> <li>for an Ethernet port — a value of down indicates an alarm event; a value of up indicates no alarm</li> </ul> |
| Alarm State                         | The current state of the alarm input:<br>ghost: no trigger equipment presently installed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                     | ok: no triggers are detected                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                     | alarm detected: alarm is outstanding                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                     | not monitored: alarm or all triggers are administratively disabled                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

Output Example

```
*A:ALU-1># show external-alarms input alarm-1/1.d-1 detail
=====
Input alarm-1/1.d-3 Detail
=====
Name : dinput3
Admin Status : up Alarm State : ok
Detect Debounce : 2 secs Clear Debounce : 2 secs
Value : open

Description : Discrete Digital Input

Threshold Severity Alarm Id Threshold State

1 closed major 3 ok

*A:ALU-1># show>#
```

Table 48      Show External Alarm Input Detail Fields

| Label                    | Description                                                                                                     |
|--------------------------|-----------------------------------------------------------------------------------------------------------------|
| Input alarm input Detail |                                                                                                                 |
| Name                     | The name of the alarm input                                                                                     |
| Admin Status             | The administrative state of the alarm input                                                                     |
| Alarm State              | The current state of the alarm input:<br>ghost: no trigger equipment is presently installed                     |
|                          | ok: no triggers are detected                                                                                    |
|                          | alarm detected: alarm is outstanding                                                                            |
|                          | not monitored: alarm or all triggers are administratively disabled                                              |
| Detect Debounce          | The debounce time associated with the detection of the specified alarm input (not applicable to Ethernet ports) |
| Clear Debounce           | The debounce time associated with the clearance of the specified alarm input (not applicable to Ethernet ports) |
| Port State               | The value of the alarm input for Ethernet ports, either up or down                                              |

**Table 48 Show External Alarm Input Detail Fields (Continued)**

| Label           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Value           | <p>The current value of the alarm input:</p> <ul style="list-style-type: none"> <li>for a digital input — the state of the digital circuit associated with the trigger (open or closed).<br/>A value of open indicates that the external equipment has not shorted this digital input to one of the four common ground pins. If no external equipment is connected to a digital input on an Auxiliary Alarm card faceplate or External Alarm connector, all digital input ports read open.</li> <li>A value of closed indicates that the external equipment has shorted this digital input to one of the four common ground pins.</li> <li>for an analog input — the current voltage level of an analog trigger, in volts. If no external equipment is connected to the Auxiliary Alarm card faceplate or External Alarm connector, both analog inputs show no applied voltage (0.0V).</li> </ul> |
| Description     | A description of the alarm input                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| #               | A summary of the alarms that are using this input as a trigger. Each input can be used for up to four alarms.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Threshold       | <p>The threshold value:</p> <ul style="list-style-type: none"> <li>for a digital input — all digital inputs are considered normally open; therefore, the threshold for each alarm is monitoring the input closing</li> <li>for an analog input — the voltage threshold for the alarm</li> <li>for Ethernet ports — the operational state threshold</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Severity        | The severity level for the specified alarm input: critical, major, minor, or warning                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Alarm Id        | The alarm identifier (1 to 2147483647)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Threshold State | <p>The threshold state indicates whether the input state contributes to the alarm:</p> <p>detected: this input triggers the alarm into an alarm-detected state</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                 | ok: this input does not trigger the alarm into an alarm-detected state                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

Output Example

```
*A:ALU-1># show external-alarms output
=====
Output Relay Summary
=====
Output Id Name Type Admin State

relay-1/1.d-1 output1 digital-out down off
relay-1/1.d-2 output2 digital-out down off
relay-1/1.d-3 output3 digital-out down off
relay-1/1.d-4 output4 digital-out down off
relay-1/1.d-5 output5 digital-out down off
relay-1/1.d-6 digital-out down off
relay-1/1.d-7 digital-out down off
relay-1/1.d-8 digital-out down off
=====
*A:ALU-1>#
```

Table 49 Show External Alarm Output Fields

| Label                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Output Relay Summary |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Output Id            | The output relay identification                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Name                 | The name of the output relay                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Type                 | The output type is digital                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Admin                | <p>The administrative state of the alarm output relay</p> <p>When the digital output relay output state is set to no shutdown, the normally closed contacts open and the normally open contacts close. The digital output displays a digital output administrative status of up and the state of active (the output relay is energized).</p> <p>When the digital output relay output state is set to shutdown, the normally closed contacts close and the normally open contacts open. The digital output displays a digital output administrative status of down and the state of off (the output relay is not energized).</p> |
| State                | The current state of the alarm output relay:<br>ghost: no equipment is installed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                      | off: the output relay is not energized (it is administratively disabled)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                      | active: the output relay is energized (active)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

Output Example

```
*A:ALU-1># show external-alarms output relay-1/1.d-1 detail
=====
Output relay-1/1.d-1 Detail
=====
Name : output1
Admin Status : down State : off
Description : Digital Output Relay
=====
*A:ALU-1>#
```

Table 50 Show External Alarm Output Detail Fields

| Label                       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Output relay-x/x.d-x Detail |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Name                        | The name of the output relay                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Admin                       | <p>The administrative state of the alarm output relay</p> <p>When the digital output relay output state is set to no shutdown, the normally closed contacts open and the normally open contacts close. The digital output displays a digital output administrative status of up and the state of active (the output relay is energized).</p> <p>When the digital output relay output state is set to shutdown, the normally closed contacts close and the normally open contacts open. The digital output displays a digital output administrative status of down and the state of off (the output relay is not energized).</p> |
| State                       | The current state of the alarm output relay:<br>ghost: no equipment is installed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                             | off: the output relay is not energized (it is administratively disabled)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                             | active: the output relay is energized (active)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Description                 | The description for the output relay                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

**Output Example**

```

*A:ALU-1># show external-alarms name
=====
External Alarm Names
=====
Name Alarm/Relay Type Admin Value State

ainput1 alarm-1/1.a-1 analog-in up 0.0 V ok
ainput2 alarm-1/1.a-2 analog-in up 0.0 V ok
dinput1 alarm-1/1.d-1 digital-in up open ok
dinput2 alarm-1/1.d-2 digital-in up open ok
dinput23 alarm-1/1.d-23 digital-in up open ok
dinput24 alarm-1/1.d-24 digital-in up open ok
dinput3 alarm-1/1.d-3 digital-in up open ok
dinput4 alarm-1/1.d-4 digital-in up open ok
output1 relay-1/1.d-1 digital-out down off
output2 relay-1/1.d-2 digital-out down off
output3 relay-1/1.d-3 digital-out down off
output4 relay-1/1.d-4 digital-out down off
output5 relay-1/1.d-5 digital-out down off
=====
*A:ALU-1>#

```

**Table 51** Show External Alarm Name Fields

| Label                       | Description                                                                                             |
|-----------------------------|---------------------------------------------------------------------------------------------------------|
| <b>External Alarm Names</b> |                                                                                                         |
| Name                        | The alarm name                                                                                          |
| Alarm/Relay                 | The name of the alarm input or output relay                                                             |
| Type                        | The alarm input type (digital input, analog input, or oper-state) or output relay type (digital output) |
| Admin                       | The administrative state of the alarm input or output relay                                             |

**Table 51 Show External Alarm Name Fields (Continued)**

| Label | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State | The current state of the alarm input or output relay.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|       | For an alarm input:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|       | ghost: no trigger equipment is presently installed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|       | ok: no triggers are detected                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|       | alarm detected: alarm is outstanding                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|       | not monitored: alarm or all triggers are administratively disabled                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|       | For an alarm output relay:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|       | ghost: no equipment is installed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|       | off: the output relay is not energized (it is administratively disabled)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|       | active: the output relay is energized (active)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Value | <p>The current value of the alarm input (this field is not applicable to outputs because the value is based on how the Auxiliary Alarm card or External Alarm connector is wired to the external equipment):</p> <ul style="list-style-type: none"> <li>• for a digital input — the state of the digital circuit associated with the trigger (open or closed).<br/>A value of open indicates that the external equipment has not shorted this digital input to one of the four common ground pins. If no external equipment is connected to a digital input on an Auxiliary Alarm card faceplate or External Alarm connector, all digital input ports read open.<br/>A value of closed indicates that the external equipment has shorted this digital input to one of the four common ground pins.</li> <li>• for an analog input — the current voltage level of an analog trigger, in volts. If no external equipment is connected to the Auxiliary Alarm card faceplate or External Alarm connector, both analog inputs show no applied voltage (0.0V).</li> </ul> |

3.14.2.1.4 Show Microwave Link Commands

mw

**Syntax**     **mw link** [*mw-link-id*] [**detail**]  
              **mw radio** [*port-id*] [**detail**] [**power**]  
              **mw radio software**

**Context**     show

**Description**     This command displays information pertaining to a microwave link or an MPR-e radio.

**Parameters**     **link** — displays microwave link summary information  
                  **mw-link-id** — identifies a specific microwave link  
                              **Values**     *id* = 1 to 24  
                  **radio** — displays MPR-e radio summary information  
                  *port-id* — identifies a specific port on a Packet Microwave Adapter card associated with  
                              the MPR-e radio, in the format *slot/mda/port*  
                  **detail** — displays detailed microwave link or MPR-e radio information  
                  **power** — displays MPR-e radio power measurement information  
                  **software** — displays the state of the MPR-e radio software

**Output**     The following outputs are examples of microwave link and MPR-e radio information:

- microwave link detail ([Output Example, Table 52](#))
- MPR-e radio detail ([Output Example, Table 53](#))
- MPR-e radio power measurement ([Output Example, Table 54](#))
- MPR-e radio software state ([Output Example, Table 55](#))



**Output Example**

```

*A:ALU-1># show>mw# link mw-link-1 detail
=====
Microwave Link
=====
Description : Packet Microwave Link
Interface : mw-link-11 IfIndex : 1610973184
Admin State : up Mode : network
Oper State : up
Oper Flag :
Last State Change : 08/15/2016 19:08:46
Transmit Diversity : enabled
 Position : main
 Force : diversity
Configured Address : 48:f7:f1:b6:1d:33
Hardware Address : 48:f7:f1:b6:1d:33
Link Alarm Synthesis

 0 0 0 0 0 0 0
 CRI MAJ MIN WAR IND | COM EQT
Protection : 1+1HSB

Type Activity Revert Main Spare Abnormal
 Command Command Condition

EPS Spare Yes Forced Automatic N/A
TPS Main Yes Automatic Automatic N/A
RPS Main Yes Automatic Automatic N/A

Port Name Type Link Role Tx Oper Alarm
 State State State

1/5/1 MPT-3-A MPT-HC 11 Main On Up Ok
1/6/1 MPT-3-B MPT-HC 11 Spare Auto Up Ok

Discovered Peer Radio

NE Ip Address : 100.10.10.3
Slot/Port : 3/1
=====
Traffic Statistics
=====
Input Output

Octets 0
Packets 0
Discards 0

Queue 1
 Octets 0
 Packets 0
 Discards 0

Queue 2
 Octets 0
 Packets 0

```

```

Discards 0 0

Queue 3
 Octets 0 0
 Packets 0 0
 Discards 0 0

Queue 4
 Octets 0 0
 Packets 0 0
 Discards 0 0

Queue 5
 Octets 0 0
 Packets 0 0
 Discards 0 0
=====

```

**Table 52**      **Show Microwave Link Detail Fields**

| Label                 | Description                                                                             |
|-----------------------|-----------------------------------------------------------------------------------------|
| <b>Microwave Link</b> |                                                                                         |
| Description           | The microwave link description                                                          |
| Interface             | The microwave link interface                                                            |
| IfIndex               | The microwave link interface index number, which reflects its initialization sequence   |
| Admin State           | The microwave link interface administrative state                                       |
| Mode                  | The microwave link interface mode                                                       |
| Oper State            | The microwave link interface operational state                                          |
| Oper Flag             | The microwave link interface operational flag                                           |
| Last State Change     | The last time that the operational status of the microwave link interface changed state |
| Transmit Diversity    | The configured state of Transmit Diversity Antenna: enabled or disabled                 |
| Position              | The configured antenna position: main or diversity                                      |
| Force                 | The configured antenna switching: not forced or diversity                               |
| Configured Address    | The configured microwave link interface address                                         |
| Hardware Address      | The configured microwave link interface hardware or system-assigned MAC address         |
| Link Alarm Synthesis  | The microwave link alarm synthesis,                                                     |

**Table 52 Show Microwave Link Detail Fields (Continued)**

| Label                        | Description                                                                         |
|------------------------------|-------------------------------------------------------------------------------------|
| Protection                   | The configured microwave link protection                                            |
| Type                         | The type of protection scheme                                                       |
| Activity                     | The type of MPR-e radio activity, either main or spare                              |
| Revert                       | Indicates whether revertive switching has been configured on the microwave link     |
| Main Command                 | The type of command configured on the main MPR-e radio, either forced or automatic  |
| Spare Command                | The type of command configured on the spare MPR-e radio, either forced or automatic |
| Abnormal Condition           | Indicates whether an abnormal condition has been detected                           |
| Port                         | The 7705 SAR-8 or 7705 SAR-18 port configured for an MPR-e radio.                   |
| Name                         | The name configured for the MPR-e radio                                             |
| Type                         | The type of MPR-e radio                                                             |
| Link                         | The microwave link ID associated with the MPR-e radio                               |
| Role                         | The role of the MPR-e radio, either main or spare                                   |
| Tx State                     | The transmit state of the MPR-e radio                                               |
| Oper State                   | The operational state of the MPR-e radio                                            |
| Alarm State                  | The alarm state of the MPR-e radio                                                  |
| <b>Discovered Peer radio</b> |                                                                                     |
| NE Ip Address                | The network element IP address of a peer radio                                      |
| Slot/Port                    | The slot and port of the peer radio                                                 |
| <b>Traffic Statistics</b>    |                                                                                     |
| Octets Input/Output          | The total number of input/output octets                                             |
| Packets Input/Output         | The total number of input/output packets                                            |
| Discards Input/Output        | The total number of input/output discards                                           |
| Queue Octets Input/Output    | The number of input/output octets per queue                                         |
| Queue Packets Input/Output   | The number of input/output packets per queue                                        |

**Table 52 Show Microwave Link Detail Fields (Continued)**

| Label                       | Description                                   |
|-----------------------------|-----------------------------------------------|
| Queue Discards Input/Output | The number of input/output discards per queue |

**Output Example**

```

*A:ALU-1># show mw radio 1/5/1 detail
=====
Microwave Radio
=====
Name : MPT-3-A
Interface : 1/5/1 Mode : Single NE
Link : mw-link-20 Role : Main
Tx State : On Oper State : up
Oper Flag :
Suppressed Faults : HighBer RSL
Database Filename : mpt_3_a.tar
Last State Change : 11/15/2012 19:56:02 IfIndex : 44072960
Mgmt Last Up : 11/15/2012 19:56:01
Mgmt Last Lost : Never
Radio Alarm Synthesis

 0 0 0 0 0 0 0
 CRI MAJ MIN WAR IND | COM EQT
Radio Information

Type : MPT-HC
Frequency Band : 15 GHz
Modules : XPIC
Software : Ok
CompanyId : ALU Mnemonic : MPT-MSX
Hardware Part Num : 3DB20423BAAB04 CLEI Code : -----
Software Part Num : 3DB20502AAAA03 Factory Id : CIT
Date Identifier : 00 Date : 110919
Serial Number : SH1136X00ZJ
Customer Field :
=====

```

**Table 53 Show MPR-e Radio Detail Fields**

| Label                  | Description                                           |
|------------------------|-------------------------------------------------------|
| <b>Microwave Radio</b> |                                                       |
| Name                   | The name configured for the MPR-e radio               |
| Interface              | The port configured for the MPR-e radio               |
| Mode                   | The MPR-e radio mode, either standalone or Single NE  |
| Link                   | The microwave link ID associated with the MPR-e radio |

**Table 53 Show MPR-e Radio Detail Fields (Continued)**

| Label                 | Description                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Role                  | The role configured for MPR-e radio, either main or spare                                                                                                                                                                                                                                                                                                                                                            |
| Tx State              | The transmit state of the MPR-e radio                                                                                                                                                                                                                                                                                                                                                                                |
| Oper State            | The operational state of the MPR-e radio                                                                                                                                                                                                                                                                                                                                                                             |
| Suppressed Faults     | The microwave link faults that are suppressed, if any: <ul style="list-style-type: none"> <li>• High Bit Error Rate (HighBer)</li> <li>• RSL threshold crossing (RSL)</li> <li>• RDI</li> <li>• All</li> </ul>                                                                                                                                                                                                       |
| Database Filename     | The MPR-e radio database filename                                                                                                                                                                                                                                                                                                                                                                                    |
| Last State Change     | The date and time of last operational state change of the MPR-e radio.                                                                                                                                                                                                                                                                                                                                               |
| IfIndex               | The MPR-e radio interface index number, which reflects its initialization sequence                                                                                                                                                                                                                                                                                                                                   |
| Mgmt Last Up          | The alarm state of the MPR-e radio                                                                                                                                                                                                                                                                                                                                                                                   |
| Mgmt Last Lost        | The alarm state of the MPR-e radio                                                                                                                                                                                                                                                                                                                                                                                   |
| Radio Alarm Synthesis | The alarm state of the MPR-e radio                                                                                                                                                                                                                                                                                                                                                                                   |
| Radio Information     | The MPR-e radio information: <ul style="list-style-type: none"> <li>Type</li> <li>Frequency Band</li> <li>Modules</li> <li>Software</li> <li>Company Id</li> <li>Mnemonic</li> <li>Hardware Part Number</li> <li>Common Language Equipment Identifier (CLEI) Code</li> <li>Software Part Number</li> <li>Factory Id</li> <li>Date Identifier</li> <li>Date</li> <li>Serial Number</li> <li>Customer Field</li> </ul> |

**Output Example**

```
*A:ALU-1># show>mw# radio 1/5/2 power
=====
Power Measurements
=====
TxPower (dBm) RSL (dBm)

Local Radio (Near End) 25.0 -60.1
Peer Radio (Far End) 40.0 -34.5
=====
```

**Table 54 Show MPR-e Radio Power Measurement Fields**

| Label                                | Description                                           |
|--------------------------------------|-------------------------------------------------------|
| <b>Power Measurements</b>            |                                                       |
| Local Radio (Near End) TxPower (dBm) | The transmit power measurement of the near-end radio  |
| Local Radio (Near End) RSL (dBm)     | The received power from the near-end radio            |
| Peer Radio (Far End) TxPower (dBm)   | The transmit power measurement from the far-end radio |
| Peer Radio (Far End) RSL (dBm)       | The received power from the far-end radio             |

**Output Example**

```
*A:ALU-1># show>mw# radio software
=====
Microwave Radio Software Summary
=====
Port Name Type Link Role Software State Progress

1/5/1 MPT-3-A MPT-HC 20 Main Ok
1/6/1 MPT-3-B MPT-HC 20 Spare Ok
=====
```

**Table 55 Show MPR-e Radio Software State Fields**

| Label                                   | Description                             |
|-----------------------------------------|-----------------------------------------|
| <b>Microwave Radio Software Summary</b> |                                         |
| Port                                    | The port configured for the MPR-e radio |
| Name                                    | The name configured for the MPR-e radio |
| Type                                    | The type of MPR-e radio                 |

**Table 55**      **Show MPR-e Radio Software State Fields (Continued)**

| Label          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Link           | The microwave link ID                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Role           | The role of the MPR-e radio, either main or spare                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Software State | <p>The state of the MPR-e radio software; the software states are:</p> <ul style="list-style-type: none"><li>• Ok - the software that is running is correct</li><li>• Ready - the software is downloaded and ready for upgrade</li><li>• Requested - a software download has been requested; waiting for the download to begin</li><li>• Forced - a software download has been forced; waiting for the download to begin</li><li>• Downloading - a software download is in progress</li><li>• Failed - a software download to this MPR-e radio has failed</li></ul> |
| Progress       | The progress of the MPR-e radio software download                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

3.14.2.1.5 Show Port Commands

port

**Syntax**     **port** *port-id* **acr** [**detail**]  
              **port** *port-id* **associations**  
              **port** *port-id* **cisco-hdlc**  
              **port** *port-id* **description**  
              **port** *port-id* **dot1x** [**detail**]  
              **port** *port-id* **dsl** [**detail**]  
              **port** *port-id* **ethernet** [**efm-oam** | **detail**]  
              **port** *port-id* **frame-relay** [**detail** | **dlci** *dlci*]  
              **port** *port-id* **ima-link**  
              **port** *port-id* **ppp** [**detail**]  
              **port** *port-id* [**statistics**] [**detail**]

**Context**     show

**Description**     This command displays port or channel information. If no command line options are specified, the **show** port command displays summary information for all ports on provisioned adapter cards.

**Parameters**     *port-id* — specifies the physical port ID

**Syntax**

*port-id*     *slot*[/*mda*[/*port*]] or  
              *slot*/*mda*/*port*[.*channel*]

where:

|             |                                                                  |                                                                     |
|-------------|------------------------------------------------------------------|---------------------------------------------------------------------|
| <i>slot</i> | 1                                                                |                                                                     |
| <i>mda</i>  | 1 to 6                                                           | 7705 SAR-8                                                          |
|             | 1 to 12 and X1 to X4                                             | 7705 SAR-18                                                         |
|             | 1 (Ethernet), 2 (T1/E1),<br>or 3 (module)                        | 7705 SAR-M                                                          |
|             | 1 (Ethernet), 2 (module position<br>1), or 3 (module position 2) | 7705 SAR-H                                                          |
|             | 1 (Ethernet), 2 (RS-232)                                         | 7705 SAR-Hc                                                         |
|             | 1 (Ethernet) or 2 (T1/E1)                                        | 7705 SAR-A                                                          |
|             | 1 (Ethernet) or 2 (GNSS RF)                                      | 7705 SAR-Ax                                                         |
|             | 1                                                                | 7705 SAR-W                                                          |
|             | 1 (Ethernet)                                                     | 7705 SAR-Wx Ethernet-only variant,<br>and Ethernet and PoE+ variant |
|             | 2 (DSL)                                                          | 7705 SAR-Wx Ethernet and<br>xDSL variant                            |



|             |                                                                                                                                           |                                                                                                                                                                                                                                          |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|             | 1 (for T1/E1 ports)                                                                                                                       | 7705 SAR-X                                                                                                                                                                                                                               |
|             | 2 (for Ethernet XOR RJ-45 ports 2/1A and 2/2A, Ethernet XOR SFP ports 2/1B and 2/2B, Ethernet ports 2/3 to 2/6, and 10GigE SFP+ port 2/7) |                                                                                                                                                                                                                                          |
|             | 3 (for Ethernet XOR RJ-45 ports 3/1A and 3/2A, Ethernet XOR SFP ports 3/1B and 3/2B, Ethernet ports 3/3 to 3/6, and 10GigE SFP+ port 3/7) |                                                                                                                                                                                                                                          |
| <i>port</i> | 1 to 2                                                                                                                                    | 2-port OC3/STM1 Channelized Adapter card ports                                                                                                                                                                                           |
|             | 1 to 2 physical ports, 1 virtual port (designated as “v-port” or port 3)                                                                  | 2-port 10GigE (Ethernet) Adapter card or 2-port 10GigE (Ethernet) module                                                                                                                                                                 |
|             | 1 to 4                                                                                                                                    | 4-port OC3/STM1 Clear Channel Adapter card ports,<br>4-port OC3/STM1 / 1-port OC12/STM4 Adapter card ports,<br>4-port DS3/E3 Adapter card ports, or<br>4-port SAR-H Fast Ethernet module ports                                           |
|             | 1 to 6                                                                                                                                    | 6-port E&M Adapter card ports,<br>6-port FXS Adapter card ports,<br>6-port Ethernet 10Gbps Adapter card ports,<br>6-port DSL Combination module ports,<br>or<br>6-port SAR-M Ethernet module ports                                       |
|             | 1 to 8                                                                                                                                    | 8-port Ethernet Adapter card ports,<br>8-port Gigabit Ethernet Adapter card ports,<br>8-port xDSL module ports,<br>8-port Voice & Teleprotection card ports,<br>8-port FXO Adapter card ports, or<br>Packet Microwave Adapter card ports |
|             | 1 to 10                                                                                                                                   | 10-port 1GigE/1-port 10GigE X-Adapter card with card in 10-port 1GigE mode                                                                                                                                                               |
|             | 1                                                                                                                                         | 10-port 1GigE/1-port 10GigE X-Adapter card with card in 1-port 10GigE mode                                                                                                                                                               |
|             | 1                                                                                                                                         | GPS Receiver module GPS RF port<br>GNSS Receiver card GNSS RF port                                                                                                                                                                       |
|             | 1 to 12                                                                                                                                   | 12-port Serial Data Interface card ports                                                                                                                                                                                                 |
|             | 1 to 16                                                                                                                                   | 16-port T1/E1 ASAP Adapter card ports                                                                                                                                                                                                    |

|             |                                                                                                                                           |                                                                                                                                                                                                                                          |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|             | 1 (for T1/E1 ports)                                                                                                                       | 7705 SAR-X                                                                                                                                                                                                                               |
|             | 2 (for Ethernet XOR RJ-45 ports 2/1A and 2/2A, Ethernet XOR SFP ports 2/1B and 2/2B, Ethernet ports 2/3 to 2/6, and 10GigE SFP+ port 2/7) |                                                                                                                                                                                                                                          |
|             | 3 (for Ethernet XOR RJ-45 ports 3/1A and 3/2A, Ethernet XOR SFP ports 3/1B and 3/2B, Ethernet ports 3/3 to 3/6, and 10GigE SFP+ port 3/7) |                                                                                                                                                                                                                                          |
| <i>port</i> | 1 to 2                                                                                                                                    | 2-port OC3/STM1 Channelized Adapter card ports                                                                                                                                                                                           |
|             | 1 to 2 physical ports, 1 virtual port (designated as “v-port” or port 3)                                                                  | 2-port 10GigE (Ethernet) Adapter card or 2-port 10GigE (Ethernet) module                                                                                                                                                                 |
|             | 1 to 4                                                                                                                                    | 4-port OC3/STM1 Clear Channel Adapter card ports,<br>4-port OC3/STM1 / 1-port OC12/STM4 Adapter card ports,<br>4-port DS3/E3 Adapter card ports, or<br>4-port SAR-H Fast Ethernet module ports                                           |
|             | 1 to 6                                                                                                                                    | 6-port E&M Adapter card ports,<br>6-port FXS Adapter card ports,<br>6-port Ethernet 10Gbps Adapter card ports,<br>6-port DSL Combination module ports,<br>or<br>6-port SAR-M Ethernet module ports                                       |
|             | 1 to 8                                                                                                                                    | 8-port Ethernet Adapter card ports,<br>8-port Gigabit Ethernet Adapter card ports,<br>8-port xDSL module ports,<br>8-port Voice & Teleprotection card ports,<br>8-port FXO Adapter card ports, or<br>Packet Microwave Adapter card ports |
|             | 1 to 10                                                                                                                                   | 10-port 1GigE/1-port 10GigE X-Adapter card with card in 10-port 1GigE mode                                                                                                                                                               |
|             | 1                                                                                                                                         | 10-port 1GigE/1-port 10GigE X-Adapter card with card in 1-port 10GigE mode                                                                                                                                                               |
|             | 1                                                                                                                                         | GPS Receiver module GPS RF port<br>GNSS Receiver card GNSS RF port                                                                                                                                                                       |
|             | 1 to 12                                                                                                                                   | 12-port Serial Data Interface card ports                                                                                                                                                                                                 |
|             | 1 to 16                                                                                                                                   | 16-port T1/E1 ASAP Adapter card ports                                                                                                                                                                                                    |

|                                                                                                                                                       |                                                                                                                                                                                                                                                      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 to 32                                                                                                                                               | 32-port T1/E1 ASAP Adapter card ports                                                                                                                                                                                                                |
| 1 to 7 (Ethernet), 1 to 16 (T1/E1), or 1 (module)                                                                                                     | 7705 SAR-M                                                                                                                                                                                                                                           |
| 1 to 8 (Ethernet)                                                                                                                                     | 7705 SAR-H                                                                                                                                                                                                                                           |
| 1 to 6 (Ethernet), 1 to 2 (RS-232)                                                                                                                    | 7705 SAR-Hc                                                                                                                                                                                                                                          |
| 1 to 2 (RS-232 ports)                                                                                                                                 | 4-port T1/E1 and RS-232 Combination module                                                                                                                                                                                                           |
| 3 to 4 (T1/E1 ports)                                                                                                                                  | 4-port T1/E1 and RS-232 Combination module                                                                                                                                                                                                           |
| 1 to 12 (Ethernet) or 1 to 8 (T1/E1)                                                                                                                  | 7705 SAR-A                                                                                                                                                                                                                                           |
| 1 to 12 (Ethernet) or 1 (GNSS RF)                                                                                                                     | 7705 SAR-Ax                                                                                                                                                                                                                                          |
| 1 to 5 (Ethernet) and vrtl-mgmt (in-band management)                                                                                                  | 7705 SAR-W                                                                                                                                                                                                                                           |
| 1 to 5 (Ethernet) (on the Ethernet-only variant and Ethernet and PoE+ variant) or 1 to 4 (Ethernet) (on the Ethernet and DSL variant, 1/2/1 to 1/2/4) | 7705 SAR-Wx                                                                                                                                                                                                                                          |
| 1 to 8 (T1/E1 ports), 1 or 2 (Ethernet XOR RJ-45/SFP ports), 3 to 6 (Ethernet ports), 7 (Ethernet SFP+ ports)                                         | 7705 SAR-X                                                                                                                                                                                                                                           |
| <i>channel</i> ds1, e1, codir, or tpif                                                                                                                | for <b>config&gt;port&gt;tdm</b> information                                                                                                                                                                                                         |
| em, fxo, or fxs                                                                                                                                       | for <b>config&gt;port&gt;voice</b> information                                                                                                                                                                                                       |
| rs232, v35, or x21                                                                                                                                    | for <b>config&gt;port&gt;serial</b> information                                                                                                                                                                                                      |
| 1 to 24 (DS1) or 1 to 32 (E1)                                                                                                                         | for <b>config&gt;port&gt;tdm&gt;channel-group</b> information                                                                                                                                                                                        |
| 1 (E&M)                                                                                                                                               | for <b>config&gt;port&gt;voice&gt;em&gt;channel-group</b> information                                                                                                                                                                                |
| 1 (DS0)                                                                                                                                               | for <b>config&gt;port&gt;tdm&gt;codir&gt;channel-group</b> , <b>config&gt;port&gt;tdm&gt;tpif&gt;channel-group</b> , <b>config&gt;port&gt;voice&gt;fxo&gt;channel-group</b> , and <b>config&gt;port&gt;voice&gt;fxs&gt;channel-group</b> information |
| 1 (RS-232, V.35, or X.21)                                                                                                                             | for <b>config&gt;port&gt;serial&gt;channel-group</b> information                                                                                                                                                                                     |

**statistics** — displays only port counter summary information

**statistics detail** — displays only port counter detail information

**acr** — displays ACR-capable port information

**acr detail** — displays ACR-capable port detail information

**cisco-hdlc** — displays cHDLC port information

**dsl** — displays DSL port information

**description** — displays port description strings

**dot1x** — displays statistics and status information about 802.1x ports

**dot1x detail** — displays statistics and status detail information about 802.1x ports

**associations** — displays a list of current router interfaces to which the port is associated

**ppp** — displays PPP protocol information for the port

**ppp detail** — displays PPP protocol detail information for the port

**ethernet** — displays Ethernet port information

**ethernet efm-oam** — displays EFM OAM information

**ethernet detail** — displays Ethernet port detail information

**frame-relay** — displays port-level frame relay statistics

**frame-relay detail** — displays frame relay port information

**frame-relay dlci** — displays circuit-level frame relay statistics

**ima-link** — displays port-level IMA link information

**Output** The following outputs are examples of port information:

- General ([Output Example, Table 56](#))
- Port Statistics ([Output Example, Table 57](#))
- Specific, Ethernet ([Output Example, Table 58](#))
- Specific, PoE Enabled ([Output Example, Table 59](#))
- Specific, Serial ([Output Example, Table 60](#))
- Specific, SONET/SDH ([Output Example, Table 61](#))
- Specific, Voice E&M ([Output Example, Table 62](#))
- Specific, Voice FXO ([Output Example, Table 63](#))
- Specific, Voice FXS ([Output Example, Table 64](#))
- Specific, DS0 Voice Channel Group ([Output Example, Table 65](#))
- Detail, SONET/SDH ([Output Example, Table 66](#))
- Detail, Ethernet ([Ethernet Output Example \(access mode\), Table 67](#))
- Detail, Ethernet ([Ethernet Output Example \(network mode\), Table 68](#))
- Detail, DSL ([DSL Output Example, Table 69](#))
- Detail, GPON ([GPON Output Example, Table 70](#))
- Detail, 10G Ring Ethernet ([Output Example, Table 71](#))

- Detail, 2.5G Virtual Ethernet ([Output Example, Table 72](#))
- Detail, TDM/DS1 ([Output Example, Table 73](#))
- Serial Channel ([Output Example, Table 74](#))
- Voice Channel, E&M ([Output Example, Table 75](#))
- Channel Group ([Output Example, Table 76](#))
- Channelized DS3 ([Output Example, Table 77](#))
- Clear Channel DS3 ([Output Example, Table 78](#))
- ACR Detail ([Output Example, Table 79](#))
- dot1x ([Output Example, Table 80](#))
- Descriptions ([Output Example, Table 81](#))
- Associations ([Output Example, Table 82](#))
- IMA Link ([Output Example, Table 83](#))
- PPP ([Output Example, Table 84](#))
- CEM ([Output Example, Table 85](#))
- Frame Relay ([Output Example, Table 86](#))
- Frame Relay DLCI ([Output Example, Table 87](#))
- HDLC and cHDLC ([Output Example, Table 87](#))
- TDM Codir or TPIF ([Output Example, Table 88](#))
- GNSS ([Output Example, Table 89](#))

Output Example

```
*A:ALU-1># show port 1/1
=====
Ports on Slot 1
=====
Port Admin Link Port Cfg Oper LAG/ Port Port Port SFP/XFP/
Id State State MTU MTU Bndl Mode Encp Type MDIMDX

1/1/1 Down No Ghost
1/1/2 Down No Ghost
1/1/2.1 Down No Ghost 1514 1514 - accs cem serial
1/1/3 Down No Ghost
1/1/4 Down No Ghost
1/1/4.1 Down No Ghost 1514 1514 - accs cem serial
1/1/5 Down No Ghost
1/1/6 Down No Ghost
1/1/7 Down No Ghost
1/1/8 Down No Ghost
1/1/9 Down No Ghost
1/1/10 Down No Ghost
1/1/11 Down No Ghost
1/1/12 Down No Ghost
=====

*A:ALU-1># show port 1/2
=====
Ports on Slot 1
=====
```

```

Port Admin Link Port Cfg Oper LAG/ Port Port Port SFP/XFP/
Id State State MTU MTU Bndl Mode Encp Type MDIMDX

1/2/1 Down No Ghost
1/2/1.sts3 Up No Ghost 1524 1524 - accs atm sonet
1/2/2 Up No Ghost
1/2/2.sts3 Down No Ghost 1572 1572 - netw pppa sonet
1/2/3 Down No Ghost
1/2/4 Down No Ghost
=====
*A:ALU-1>#

A:ALU-1># show port 1/3
=====
Ports on Slot 1
=====
Port Admin Link Port Cfg Oper LAG/ Port Port Port SFP/XFP/
Id State State MTU MTU Bndl Mode Encp Type MDIMDX

1/3/1 Down No Ghost
1/3/1.1 Down No Ghost 1514 1514 - accs cem tdm
1/3/2 Down No Ghost
1/3/2.1 Down No Ghost 1514 1514 - accs cem tdm
1/3/3 Down No Ghost
1/3/4 Down No Ghost
1/3/5 Down No Ghost
1/3/6 Down No Ghost
1/3/7 Down No Ghost
1/3/8 Down No Ghost
1/3/9 Down No Ghost
1/3/10 Down No Ghost
1/3/11 Down No Ghost
1/3/12 Down No Ghost
1/3/13 Down No Ghost
1/3/14 Down No Ghost
1/3/15 Down No Ghost
1/3/16 Down No Ghost
1/3/16.1 Down No Ghost 1572 1572 - netw unkn tdm
=====

```

**Table 56** Show General Port Output Fields

| Label       | Description                                                            |
|-------------|------------------------------------------------------------------------|
| Port ID     | The port ID configured or displayed in the <i>slot/mda/port</i> format |
| Admin State | Up: the administrative state is up                                     |
|             | Down: the administrative state is down                                 |
| Link        | Yes: a physical link is present                                        |
|             | No: a physical link is not present                                     |

**Table 56 Show General Port Output Fields (Continued)**

| Label       | Description                                                                                                                                                                                                                                                                                                                                 |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port State  | Up: the port is physically present and has a physical link                                                                                                                                                                                                                                                                                  |
|             | Down: the port is physically present but does not have a link                                                                                                                                                                                                                                                                               |
|             | Ghost: the port is not physically present                                                                                                                                                                                                                                                                                                   |
|             | None: the port is in its initial creation state or about to be deleted                                                                                                                                                                                                                                                                      |
|             | Link Up: the port is physically present and has a physical link.<br>When Link Up appears at the lowest level of a TDM tributary, it means the physical connection is active but the port is waiting before data traffic can flow. It is a waiting state and indicates that data traffic will not flow until it transitions to the Up state. |
|             | Link Down: the port is physically present but does not have a link                                                                                                                                                                                                                                                                          |
| Cfg MTU     | The configured MTU                                                                                                                                                                                                                                                                                                                          |
| Oper MTU    | The negotiated size of the largest packet that can be sent on the port or channel specified in octets                                                                                                                                                                                                                                       |
| LAG/Bndl    | The Link Aggregation Group (LAG) or multilink bundle to which a TDM port is assigned                                                                                                                                                                                                                                                        |
| Port Mode   | network: the port is configured for transport network use                                                                                                                                                                                                                                                                                   |
|             | access: the port is configured for service access                                                                                                                                                                                                                                                                                           |
|             | hybrid: the port is configured for hybrid use (transport network and service access per VLAN)                                                                                                                                                                                                                                               |
| Port Encp   | The encapsulation type on the port                                                                                                                                                                                                                                                                                                          |
| Port Type   | The type of port or optics installed                                                                                                                                                                                                                                                                                                        |
| SFP/MDI MDX | The SFP type on an Ethernet port (Ethernet, Fast Ethernet, or GigE)                                                                                                                                                                                                                                                                         |

**Output Example**

```
*A:ALU-1># show port 1/1 statistics detail
```

```
=====
```

Port Statistics on Slot 1

```
=====
```

| Port<br>Id  | Ingress<br>Packets | Ingress<br>Octets | Egress<br>Packets | Egress<br>Octets |
|-------------|--------------------|-------------------|-------------------|------------------|
| 1/1/1       | 0                  | 0                 | 0                 | 0                |
| 1/1/1.rs232 | 0                  | 0                 | 0                 | 0                |
| 1/1/2       | 0                  | 0                 | 0                 | 0                |
| 1/1/2.rs232 | 0                  | 0                 | 0                 | 0                |
| 1/1/2.1     | 0                  | 0                 | 0                 | 0                |
| 1/1/3       | 0                  | 0                 | 0                 | 0                |
| 1/1/4       | 0                  | 0                 | 0                 | 0                |
| 1/1/4.v35   | 0                  | 0                 | 0                 | 0                |
| 1/1/4.1     | 0                  | 0                 | 0                 | 0                |
| 1/1/5       | 0                  | 0                 | 0                 | 0                |
| 1/1/6       | 0                  | 0                 | 0                 | 0                |
| 1/1/7       | 0                  | 0                 | 0                 | 0                |
| 1/1/8       | 0                  | 0                 | 0                 | 0                |
| 1/1/9       | 0                  | 0                 | 0                 | 0                |
| 1/1/10      | 0                  | 0                 | 0                 | 0                |
| 1/1/11      | 0                  | 0                 | 0                 | 0                |
| 1/1/12      | 0                  | 0                 | 0                 | 0                |

```
=====
```

```
*A:ALU-1>#
```

```
*A:ALU-1># show port 1/2 statistics detail
```

```
=====
```

Port Statistics on Slot 1

```
=====
```

| Port<br>Id | Ingress<br>Packets | Ingress<br>Octets | Egress<br>Packets | Egress<br>Octets |
|------------|--------------------|-------------------|-------------------|------------------|
| 1/2/1      | 0                  | 0                 | 0                 | 0                |
| 1/2/1.sts3 | 0                  | 0                 | 0                 | 0                |
| 1/2/2      | 0                  | 0                 | 0                 | 0                |
| 1/2/2.sts3 | 0                  | 0                 | 0                 | 0                |
| 1/2/3      | 0                  | 0                 | 0                 | 0                |
| 1/2/4      | 0                  | 0                 | 0                 | 0                |

```
=====
```

```
*A:ALU-1>#
```



```

*A:ALU-1># show port 1/5 statistics detail
=====
Port Statistics on Slot 1
=====
Port Ingress Ingress Egress Egress
Id Packets Octets Packets Octets

1/5/1 0 0 0 0
1/5/2 0 0 0 0
1/5/3 0 0 0 0
1/5/4 0 0 0 0
1/5/5 0 0 0 0
1/5/6 0 0 0 0
1/5/7 0 0 0 0
1/5/8 0 0 0 0
=====
*A:ALU-1>#

```

**Table 57** Show Port Statistics Output Fields

| Label           | Description                                                            |
|-----------------|------------------------------------------------------------------------|
| Port ID         | The port ID configured or displayed in the <i>slot/mda/port</i> format |
| Ingress Packets | The number of ingress packets coming into the port                     |
| Ingress Octets  | The number of ingress octets coming into the port                      |
| Egress Packets  | The number of egress packets transmitted from the port                 |
| Egress Octets   | The number of egress octets transmitted from the port                  |

**Output Example**

```

*A:ALU-1># show port 1/5/8
=====
Ethernet Interface
=====
Description : 10/100/Gig Ethernet SFP
Interface : 1/5/8
Link-level : Ethernet
Admin State : up
Oper State : up
Physical Link : Yes
Single Fiber Mode : No
IfIndex : 40108032
Last State Change : 11/24/2009 13:05:41
Last Cleared Time : N/A
Phys State Chng Cnt: 0

Oper Speed : 1 Gbps
Config Speed : 1 Gbps
Oper Duplex : full
Config Duplex : full
MTU : 1514

Hold time up : 0 seconds
Hold time down : 0 seconds
DDM Events : Enabled

Configured Mode : hybrid
Dot1Q Ethertype : 0x8100
Ing. Pool % Rate : 100
Ing. Acc. Wt. : 50
Ing. Net. Wt. : 50

Encap Type : 802.1q
QinQ Ethertype : 0x8100
Egr. Pool % Rate : 100
Egr. Acc. Wt. : 50
Egr. Net. Wt. : 50

```

```

Net. Egr. Queue Pol: default
Auto-negotiate : true MDI/MDX : unknown
Net. Egr. ShaperPol: 2
Acc. Egr. ShaperPol: 5
Net. Scheduler Mode: 16-priority
Config Phy-tx-clock: auto-pref-slave Oper Phy-tx-clock: N/A
SapEgr.Unshaped-Cir: 0 Kbps
SapEgr.Shaper Pol : default
NetEgr.Unshaped-Cir: 0 Kbps
Allow Eth-BN : True
BN Egr.Rate in use : 765000 Eth-BN hold time : 6
Egress Rate : Default Ingress Rate : n/a
Egr.Rate Incl.FCS : Disabled
Ingress CBS(bytes) : 130816 Src-pause : Disabled
 LACP Tunnel : Disabled
Down-when-looped : Disabled Keep-alive : 10
Loop Detected : False Retry : 120
Use Broadcast Addr : False

Loopback : none Swap Mac Addr : Disabled
Loopback Time Left : unspecified
Cfm Loopback : Disabled

Sync. Status Msg. : Enabled Rx Quality Level : 0xf(dus)

PTP Asymmetry : 0 Edge Timestamp : Disable
Timestamp Capable : True

CRC Mon SD Thresh : Disabled CRC Mon Window : 10 seconds
CRC Mon SF Thresh : Disabled

Configured Address : 00:1a:f0:d4:09:de
Hardware Address : 00:1a:f0:d4:09:de
Cfg Alarm :
Alarm Status :

Transceiver Data

Transceiver Type : SFP
Model Number : 3HE00027AAAA02 ALU IPUIAELDAB
TX Laser Wavelength: 850 nm Diag Capable : yes
Connector Code : LC Vendor OUI : 00:90:65
Manufacture date : 2009/07/09 Media : Ethernet
Serial Number : PFS3UTC
Part Number : FTRJ8519P2BNL-A5
Optical Compliance : GIGE-SX
Link Length support: 300m for 50u MMF; 150m for 62.5u MMF
SFP Sync-E Capable : yes

```

```

=====
Transceiver Digital Diagnostic Monitoring (DDM), Internally Calibrated
=====

```

|                            | Value  | High Alarm | High Warn | Low Warn | Low Alarm |
|----------------------------|--------|------------|-----------|----------|-----------|
| Temperature (C)            | +27.1  | +95.0      | +90.0     | -20.0    | -25.0     |
| Supply Voltage (V)         | 3.31   | 3.90       | 3.70      | 2.90     | 2.70      |
| Tx Bias Current (mA)       | 6.3    | 17.0       | 14.0      | 2.0      | 1.0       |
| Tx Output Power (dBm)      | -4.47  | -2.00      | -2.00     | -11.02   | -11.74    |
| Rx Optical Power (avg dBm) | -20.51 | 1.00       | -1.00     | -18.01!  | -20.00!   |

```

=====
Traffic Statistics
=====
 Input Output

Octets 11076096 11075584
Packets 86532 86529
Errors 0 0
=====

Port Statistics
=====
 Input Output

Unicast Packets 0 1
Multicast Packets 86532 86528
Broadcast Packets 0 0
Discards 0 0
Unknown Proto Discards 0
=====

Port Discard Statistics
=====
 Input Output

Inv L2 Packets : 0
Inv IP Packets : 0
CSM Ingress Queues CSM Egress Queues
 Hi : 0 Common : 0
 Low : 0
 Ftp : 0
=====

Ethernet CFM Statistics
=====
Cfm LbmRx : 0
Cfm LbReplyTx : 0 Cfm LbmDropped : 0

Num Bn Rate Chng : 1 Last BnRateChng : 04/12/2017 21:20:53
Valid BnmRx : 2 Last Valid BnmRx : 04/12/2017 21:21:10
Invalid BnmRx : 0
BnmOutOfRangeBW : 0
=====

Ethernet-like Medium Statistics
=====
Alignment Errors : 0 Sngl Collisions : 0
FCS Errors : 0 Mult Collisions : 0
SQE Test Errors : 0 Late Collisions : 0
CSE : 0 Excess Collisns : 0
Too long Frames : 0 Int MAC Tx Errs : 0
Symbol Errors : 0 Int MAC Rx Errs : 0
In Pause Frames : 0 Out Pause Frames : 0
=====
*A:ALU-1>#

```

**Table 58 Show Specific Port Output Fields (GigE Port with Optical SFP)**

| Label                     | Description                                                              |
|---------------------------|--------------------------------------------------------------------------|
| <b>Ethernet Interface</b> |                                                                          |
| Description               | A text description of the port                                           |
| Interface                 | The port ID displayed in the <i>slot/mda/port</i> format                 |
| Link-level                | The type of link for which the port is configured                        |
| Admin State               | up: the administrative state is up                                       |
|                           | down: the administrative state is down                                   |
| Oper State                | up: the operating state is up                                            |
|                           | down: the operating state is down                                        |
| Reason Down               | Indicates that the port has gone down due to Link Loss Forwarding        |
| Physical Link             | Yes: a physical link is present                                          |
|                           | No: a physical link is not present                                       |
| Single Fiber Mode         | Yes: single fiber mode                                                   |
|                           | No: not single fiber mode                                                |
| IfIndex                   | The interface's index number, which reflects its initialization sequence |
| Last State Change         | The last time that the operational status of the port changed state      |
| Last Cleared Time         | The time since the last clear                                            |

**Table 58 Show Specific Port Output Fields (GigE Port with Optical SFP)**

| Label               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Phys State Chng Cnt | <p>The physical state change counter. This counter increments when a fully qualified (debounced) transition occurs at the physical layer of an Ethernet port, including the following transitions of the port state as displayed in the <b>show port slot/mda/port</b> output:</p> <ul style="list-style-type: none"> <li>• from Down to Link Up or Up</li> <li>• from Link Up or Up to Down</li> </ul> <p>This counter does not increment for changes only in the link protocol states. That is, if the physical link is up, any transitions of the port state due to link protocols (for example, 802.3ah EFM OAM, LACP, 802.1ag) do not cause the counter to increment. The following port state transitions are examples of transitions that are not counted:</p> <ul style="list-style-type: none"> <li>• from Link Up to Up</li> <li>• from Up to Link Up</li> </ul> |
| Configured Mode     | network: the port is configured for transport network use                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                     | access: the port is configured for service access                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                     | hybrid: the port is configured for hybrid use (transport network and service access per VLAN)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Dot1Q Ethertype     | The Ethertype expected when the port's encapsulation type is dot1q                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| QinQ Ethertype      | The Ethertype expected when the port's encapsulation type is qinq                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Ing. Pool % Rate    | The amount of ingress buffer space, expressed as a percentage of the available buffer space, that will be allocated to the port or channel for ingress buffering                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Net. Egr. Queue Pol | default: the default policy is used                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                     | network: the network egress queue policy is used                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Egr. Sched. Pol     | The egress scheduling policy                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Net. Egr. ShaperPol | The network egress shaper policy ID                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Acc. Egr. ShaperPol | The access egress shaper policy ID                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Net. Scheduler Mode | The network scheduler mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Auto-negotiate      | true: the link attempts to automatically negotiate the link speed and duplex parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                     | false: the duplex and speed values are used for the link                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

**Table 58 Show Specific Port Output Fields (GigE Port with Optical SFP)**

| Label               | Description                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Config Phy-tx-clock | The mode used to establish timing control of a 1000Base-T port. The options are: <ul style="list-style-type: none"> <li>• N/A—the port does not support 1000Base-T</li> <li>• auto-pref-master—prefers to be master during autonegotiation</li> <li>• auto-pref-slave—prefers to be slave during autonegotiation</li> <li>• slave—the port is forced to be slave</li> <li>• master—the port is forced to be master</li> </ul> |
| Oper Phy-tx-clock   | The operational value of the MASTER-SLAVE relationship of the 1000Base-T physical layer transmit clock. The options are: <ul style="list-style-type: none"> <li>• N/A—the port or the inserted SFP does not support 1000Base-T, the port is down, or negotiation failed</li> <li>• slave—the port is slave</li> <li>• master—the port is master</li> </ul>                                                                    |
| SapEgr.Shaper Pol   | The SAP egress shaper policy for the port                                                                                                                                                                                                                                                                                                                                                                                     |
| SapEgr.Unshaped-Cir | The CIR rate for the aggregate of all the unshaped 4-priority SAPs on the port                                                                                                                                                                                                                                                                                                                                                |
| NetEgr.Unshaped-Cir | The CIR rate for the aggregate of all the unshaped VLANs on the port                                                                                                                                                                                                                                                                                                                                                          |
| Allow Eth-BN        | Indicates whether Ethernet Bandwidth Notification (ETH-BN) is allowed on the port: True or False                                                                                                                                                                                                                                                                                                                              |
| BN Egr.Rate in use  | The egress rate in use based on the request from the ETH-BN server MEP                                                                                                                                                                                                                                                                                                                                                        |
| Eth-BN hold time    | The configured hold time (in seconds) between an egress rate change based on a received Bandwidth Notification Message (BNM) and the next change request that will be accepted                                                                                                                                                                                                                                                |
| Egress Rate         | The maximum amount of egress bandwidth (in kilobits per second) that this Ethernet interface can generate                                                                                                                                                                                                                                                                                                                     |
| Egr.Rate Incl.FCS   | The configured state of egress rate FCS inclusion: enabled or disabled                                                                                                                                                                                                                                                                                                                                                        |
| Ingress CBS (bytes) | Indicates the ingress committed buffer space                                                                                                                                                                                                                                                                                                                                                                                  |
| Src-pause           | A notification to slow down the transmission rate when it exceeds the bandwidth limit                                                                                                                                                                                                                                                                                                                                         |

**Table 58 Show Specific Port Output Fields (GigE Port with Optical SFP)**

| Label              | Description                                                                                                                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| LACP Tunnel        | Indicates whether LACP packet tunneling is enabled                                                                                                                                                                  |
| Down-when-looped   | Enabled: The down-when-looped feature is enabled on the port                                                                                                                                                        |
|                    | Disabled: The down-when-looped feature is disabled on the port                                                                                                                                                      |
| Keep-alive         | The time interval between keepalive PDUs transmitted toward the network during loop detection by the down-when-looped feature                                                                                       |
| Loop Detected      | Indicates whether a loop is detected on the port                                                                                                                                                                    |
| Retry              | The minimum wait time before the port is re-enabled after it is brought down due to a loop detection                                                                                                                |
| Use Broadcast Addr | Indicates whether the down-when-looped feature has been configured to compare the destination MAC address of received PDUs to the broadcast MAC address instead of the MAC address of the port                      |
| Loopback           | The type of loopback configured on the port, either line, internal, or none                                                                                                                                         |
| Swap Mac Addr      | Indicates whether MAC address swapping is enabled                                                                                                                                                                   |
| Loopback Time Left | The number of seconds left in a timed loopback<br>If there is no loopback configured or the configured loopback is latched, the value is unspecified<br>If configured loopback is persistent, the value persistent. |
| Cfm Loopback       | Indicates whether the CFM loopback is enabled                                                                                                                                                                       |
| Sync. Status Msg.  | Indicates whether Synchronization Status Messaging is enabled on the port                                                                                                                                           |
| PTP Asymmetry      | Indicates whether PTP asymmetry is enabled                                                                                                                                                                          |
| Edge Timestamp     | Indicates whether the edge timestamp is enabled                                                                                                                                                                     |
| Timestamp Capable  | Indicates whether the port is timestamp-capable                                                                                                                                                                     |
| CRC Mon SD Thresh  | Indicates the CRC signal degrade threshold value (1 to 9), if enabled                                                                                                                                               |
| CRC Mon SF Thresh  | Indicates the CRC signal fail threshold value (1 to 9), if enabled                                                                                                                                                  |
| CRC Mon Window     | Indicates the CRC window sampling size value (5 to 60)                                                                                                                                                              |

**Table 58 Show Specific Port Output Fields (GigE Port with Optical SFP)**

| Label              | Description                                                                                                                               |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| Rx Quality Level   | The Synchronization Status Messaging quality level value received on the port                                                             |
| Code-Type          | The Synchronization Status Messaging quality level code type                                                                              |
| Tx Quality Level   | The Synchronization Status Messaging quality level value transmitted on the port                                                          |
| Tx DUS/DNU         | Indicates whether the transmission of the QL-DUS/DNU value in synchronization status messages is enabled or disabled on the port          |
| Configured Address | The base chassis Ethernet MAC address                                                                                                     |
| Hardware Address   | The interface hardware- or system-assigned MAC address at its protocol sublayer                                                           |
| Cfg Alarm          | The type of alarms to be logged and reported for the Ethernet port                                                                        |
| Alarm Status       | The current alarm state                                                                                                                   |
| Oper Speed         | The operating speed of the interface                                                                                                      |
| Config Speed       | The configured speed of the interface                                                                                                     |
| Oper Duplex        | full: the link is operating at full-duplex mode<br>half: the link is operating at half-duplex mode                                        |
| Config Duplex      | full: the link is set at full-duplex mode<br>half: the link is set at half-duplex mode                                                    |
| MTU                | The size of the largest packet that can be sent/received on the Ethernet physical interface, specified in octets                          |
| Hold time up       | The link-up dampening time in seconds                                                                                                     |
| Hold time down     | The link-down dampening time in seconds                                                                                                   |
| Encap Type         | null: ingress frames will not use any tags or labels to delineate a service                                                               |
|                    | dot1q: ingress frames carry 802.1Q tags, where each tag signifies a different service                                                     |
|                    | qinq: ingress frames carry two 802.1Q tags, where the outer tag is the service provider tag and the inner tag is the customer service tag |



**Table 58**      **Show Specific Port Output Fields (GigE Port with Optical SFP)**

| Label            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Egr. Pool % Rate | The amount of egress buffer space, expressed as a percentage of the available buffer space, that will be allocated to the port or channel for egress buffering                                                                                                                                                                                                                                                                                                                             |
| MDI/MDX          | Ethernet type                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Transceiver Type | The type of transceiver (SFP)                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                  | <p>The following information is provided for a configured SFP:</p> <ul style="list-style-type: none"><li>• model number</li><li>• TX laser wavelength</li><li>• whether it is diagnostics capable</li><li>• connector code</li><li>• vendor organizationally unique identifier (OUI)</li><li>• manufacture date</li><li>• media</li><li>• serial number</li><li>• part number</li><li>• optical compliance</li><li>• link length support:</li><li>• whether it is Sync-E capable</li></ul> |

**Table 58 Show Specific Port Output Fields (GigE Port with Optical SFP)**

| Label                                                                         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Transceiver Digital Diagnostic Monitoring (DDM), Externally Calibrated</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                                                               | <p>SFP manufacturers specifications guidelines contained in specification SFF-8472, for the following:</p> <ul style="list-style-type: none"> <li>• temperature (C)</li> <li>• supply voltage (V)</li> <li>• Tx bias current (mA)</li> <li>• Tx output power (dBm)</li> <li>• Rx optical power (avg dBm)</li> </ul> <p>For the above categories, the following values are shown:</p> <ul style="list-style-type: none"> <li>• Value is the current measured value of each variable</li> <li>• High Alarm is the measurement of Value that will cause a DDM High Alarm to be output</li> <li>• High Warn is the measurement of Value that will cause a DDM High Warning Alarm to be output</li> <li>• Low Warn is the measurement of Value that will cause a DDM Low Warning Alarm to be output</li> <li>• Low Alarm is the measurement of Value that will cause a DDM Low Alarm to be output</li> </ul> <p>If alarms/warnings are raised, there will be an "!" in the output</p> |
| <b>Traffic Statistics</b>                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Octets Input/Output                                                           | The total number of octets received and transmitted on the port                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Packets Input/Output                                                          | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

**Table 58 Show Specific Port Output Fields (GigE Port with Optical SFP)**

| Label                          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Errors Input/Output            | <p>For packet-oriented interfaces, the number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol. For character-oriented or fixed-length interfaces, the number of inbound transmission units that contained errors preventing them from being deliverable to a higher-layer protocol.</p> <p>For packet-oriented interfaces, the number of outbound packets that could not be transmitted because of errors. For character-oriented or fixed-length interfaces, the number of outbound transmission units that could not be transmitted because of errors.</p> |
| <b>Port Statistics</b>         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Unicast packets Input/Output   | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                                                                                                         |
| Multicast packets Input/Output | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a unicast or broadcast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                                                                                                             |
| Broadcast packets Input/Output | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or multicast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a unicast or multicast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                                                                                                             |
| Discards Input/Output          | The number of inbound/outbound packets chosen to be discarded to possibly free up buffer space                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

**Table 58 Show Specific Port Output Fields (GigE Port with Optical SFP)**

| Label                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Unknown proto discards Input/Output | For packet-oriented interfaces, the number of packets received via the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received via the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0. Unknown proto discards do not show up in the packet counts. |
| <b>Port Discard Statistics</b>      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Inv L2 Packets Input                | The number of invalid packets discarded due to an unknown Layer 2 ID                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Inv IP Packets Input                | The number of invalid IP packets discarded                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| CSM Ingress Queues Input            | The number of incoming control packets discarded                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| CSM Egress Queues Output            | The number of outgoing control packets discarded                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Ethernet CFM Statistics</b>      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Cfm LbmRx                           | The number of LBMs received                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Cfm LbReplyTx                       | The number of LBRs transmitted                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Cfm LbmDropped                      | The number of LBMs dropped                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Num Bn Rate Chng                    | The number of times that the port egress rate is dynamically changed based on Bandwidth Notification (BN) messages<br>Note: not every bandwidth change indicated by a BNM triggers a port egress rate change                                                                                                                                                                                                                                                                                                                       |
| Last BnRateChng                     | The time that the port egress rate was last changed based on a BNM                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Valid BnmRx                         | The number of valid BN messages received                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Last Valid BnmRx                    | The time that the last valid BNM was received                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Invalid BnmRx                       | The number of invalid BN messages received                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| BnmOutOfRangeBW                     | The number of BN messages received with a requested bandwidth that was out of range                                                                                                                                                                                                                                                                                                                                                                                                                                                |

**Table 58 Show Specific Port Output Fields (GigE Port with Optical SFP)**

| Label                                  | Description                                                                                                                                                                                                                                                                                              |
|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Ethernet-like Medium Statistics</b> |                                                                                                                                                                                                                                                                                                          |
| Alignment Errors                       | The total number of packets received that had a length (excluding framing bits, but including FCS octets) of between 64 and 1518 octets, inclusive, but that had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets |
| FCS Errors                             | The number of frames received that are an integral number of octets in length but do not pass the FCS check                                                                                                                                                                                              |
| SQE Errors                             | The number of times that the SQE TEST ERROR is received                                                                                                                                                                                                                                                  |
| CSE                                    | The number of times that the carrier sense condition was lost or never asserted when attempting to transmit a frame                                                                                                                                                                                      |
| Too long Frames                        | The number of frames received that exceed the maximum permitted frame size                                                                                                                                                                                                                               |
| Symbol Errors                          | For an interface operating at 100 Mb/s, the number of times there was an invalid data symbol when a valid carrier was present                                                                                                                                                                            |
| In Pause Frames                        | The number of IEEE 802.3x pause frames received for flow control; traffic is momentarily disrupted                                                                                                                                                                                                       |
| Sngl Collisions                        | The number of frames that are involved in a single collision, and are subsequently transmitted successfully                                                                                                                                                                                              |
| Mult Collisions                        | The number of frames that are involved in more than one collision and are subsequently transmitted successfully                                                                                                                                                                                          |
| Late Collisions                        | The number of times that a collision is detected later than one slotTime into the transmission of a packet                                                                                                                                                                                               |
| Excess Collisns                        | The number of frames for which a transmission fails due to excessive collisions                                                                                                                                                                                                                          |
| Int MAC Tx Errs                        | The number of frames for which a transmission fails due to an internal MAC sublayer transmit error                                                                                                                                                                                                       |
| Int MAC Rx Errs                        | The number of frames for which a reception fails due to an internal MAC sublayer receive error                                                                                                                                                                                                           |
| Out Pause Frames                       | The number of IEEE 802.3x pause frames sent for flow control; traffic is momentarily disrupted                                                                                                                                                                                                           |

**Output Example**

```

*A:ALU-1># show port 1/1/7 detail
=====
Ethernet Interface
=====
Description : 10/100/Gig Ethernet TX
Interface : 1/1/7
Link-level : Ethernet
Admin State : down
Oper State : down
Physical Link : No
Single Fiber Mode : No
IfIndex : 44302336
Last State Change : 04/14/2014 14:05:25
Last Cleared Time : N/A

Configured Mode : access
Dot1Q Ethertype : 0x8100
Ing. Pool % Rate : 100
Net. Egr. Queue Pol: default
Auto-negotiate : true
Config Phy-tx-clock: auto-pref-slave
Allow Eth-BN : True
BN Egr.Rate in use : 765000
Egress Rate : Default
Down-when-looped : Disabled
Loop Detected : False
Use Broadcast Addr : False

Encap Type : Null
Egr. Pool % Rate : 100
MDI/MDX : unknown
Oper Phy-tx-clock : N/A
Eth-BN hold time : 6
Ingress Rate : n/a
Keep-alive : 10
Retry : 120

Loopback : none
Loopback Time Left : unspecified
Cfm Loopback : Disabled

Swap Mac Addr : Disabled

PoE Mode : None
Poe Class : Class 0
PoE Maximum Power : None
PoE Detection : Searching
PoE Fault Reason : none
PoE Power In Use : 0.0 watts

Sync. Status Msg. : Disabled
Rx Quality Level : N/A

PTP Asymmetry : 0
Timestamp Capable : False
Edge Timestamp : Disable

CRC Mon SD Thresh : Disabled
CRC Mon SF Thresh : Disabled
CRC Mon Window : 10 seconds

Configured Address : 6c:be:e9:b1:af:1b
Hardware Address : 6c:be:e9:b1:af:1b
Cfg Alarm :
Alarm Status :

=====
Traffic Statistics
=====

Input Output

Octets 10728 14236
Packets 102 156
Errors 0 0

```

```

=====
Port Statistics
=====
 Input Output

Unicast Packets 102 101
Multicast Packets 0 52
Broadcast Packets 0 3
Discards 0 0
Unknown Proto Discards 0
=====

=====
Port Discard Statistics
=====
 Input Output

Inv L2 Packets : 0
Inv IP Packets : 0

CSM Ingress Queues CSM Egress Queues
 Hi : 0 Common : 0
 Medium : 0
 Low : 0
=====

=====
Port Control Statistics
=====

Ingress Queue CTL Packets Octets
 Forwarded : 0 0
 Dropped : 0 N/A

Egress Queue CTL Packets Octets
 Forwarded : 0 0
 Dropped : 0 N/A
=====

=====
Ethernet-like Medium Statistics
=====

Alignment Errors : 0 Sngl Collisions : 0
FCS Errors : 0 Mult Collisions : 0
SQE Test Errors : 0 Late Collisions : 0
CSE : 0 Excess Collisns : 0
Too long Frames : 0 Int MAC Tx Errs : 0
Symbol Errors : 0 Int MAC Rx Errs : 0
In Pause Frames : 0 Out Pause Frames : 0
=====

=====
Ethernet CFM Statistics
=====

Cfm LbmRx : 0
Cfm LbReplyTx : 0 Cfm LbmDropped : 0

```

```

Num Bn Rate Chng : 1 Last BnRateChng : 04/12/2017 21:20:53
Valid BnmRx : 2 Last Valid BnmRx : 04/12/2017 21:21:10
Invalid BnmRx : 0
BnmOutOfRangeBW : 0
=====
*A:ALU-1>#

```

**Table 59 Show PoE Port Output Fields (Ethernet)**

| Label                     | Description                                                                                                                                               |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Ethernet Interface</b> |                                                                                                                                                           |
| Description               | A text description of the port                                                                                                                            |
| Interface                 | The port ID displayed in the <i>slot/mda/port</i> format                                                                                                  |
| Oper Speed                | The operating speed of the interface                                                                                                                      |
| Link-level                | Ethernet: the port is configured as Ethernet                                                                                                              |
| Config Speed              | The configured speed of the interface                                                                                                                     |
| Admin State               | up: the port is administratively up                                                                                                                       |
|                           | down: the port is administratively down                                                                                                                   |
| Oper Duplex               | The operating duplex mode of the interface                                                                                                                |
| Oper State                | up: the port is operationally up                                                                                                                          |
|                           | down: the port is operationally down                                                                                                                      |
| Config Duplex             | full: the link is configured to full-duplex mode                                                                                                          |
|                           | half: the link is configured to half-duplex mode                                                                                                          |
| Physical Link             | Yes: a physical link is present                                                                                                                           |
|                           | No: a physical link is not present                                                                                                                        |
| MTU                       | The size of the largest packet that can be sent/received on the Ethernet physical interface, specified in octets                                          |
| Single Fiber Mode         | Yes: single fiber mode                                                                                                                                    |
|                           | No: not single fiber mode                                                                                                                                 |
| IfIndex                   | The interface's index number, which reflects its initialization sequence                                                                                  |
| Hold time up              | The link-up dampening time in seconds. The port link dampening timer value that reduces the number of link transitions reported to upper layer protocols. |



**Table 59 Show PoE Port Output Fields (Ethernet) (Continued)**

| Label               | Description                                                                                                                                           |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| Last State Change   | The last time that the operational status of the port changed state                                                                                   |
| Hold time down      | The link-down dampening time in seconds. The down timer controls the dampening timer for link down transitions.                                       |
| Last Cleared Time   | The time since the last clear                                                                                                                         |
| Configured Mode     | network: the port is configured for transport network use                                                                                             |
|                     | access: the port is configured for service access                                                                                                     |
|                     | hybrid: the port is configured for hybrid use (transport network and service access per VLAN)                                                         |
| Encap Type          | null: ingress frames will not use any tags or labels to delineate a service                                                                           |
|                     | dot1q: ingress frames carry 802.1Q tags, where each tag signifies a different service                                                                 |
|                     | qinq: ingress frames carry two 802.1Q tags, where the outer tag is the service provider tag and the inner tag is the customer service tag             |
| Dot1Q Ethertype     | The protocol carried in a dot1q Ethernet frame                                                                                                        |
| Ing. Pool % Rate    | The amount of ingress buffer space, expressed as a percentage of the available buffer space, that will be allocated to the port for ingress buffering |
| Egr. Pool % Rate    | The amount of egress buffer space, expressed as a percentage of the available buffer space, that will be allocated to the port for egress buffering   |
| Net.Egr. Queue Pol. | The number of the associated network egress queue QoS policy, or default if the default policy is used                                                |
| Auto-negotiate      | true: the link attempts to automatically negotiate the link speed and duplex parameters                                                               |
|                     | false: the duplex and speed values are used for the link                                                                                              |
| MDI/MDX             | Indicates the Ethernet interface type                                                                                                                 |

**Table 59 Show PoE Port Output Fields (Ethernet) (Continued)**

| Label               | Description                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Config Phy-tx-clock | The mode used to establish timing control of a 1000Base-T port. The options are: <ul style="list-style-type: none"> <li>• N/A—the port does not support 1000Base-T</li> <li>• auto-pref-master—prefers to be master during autonegotiation</li> <li>• auto-pref-slave—prefers to be slave during autonegotiation</li> <li>• slave—the port is forced to be slave</li> <li>• master—the port is forced to be master</li> </ul> |
| Oper Phy-tx-clock   | The operational value of the master-slave relationship of the 1000Base-T physical layer transmit clock. The options are: <ul style="list-style-type: none"> <li>• N/A—the port or the inserted SFP does not support 1000Base-T, the port is down, or negotiation failed</li> <li>• slave—the port is slave</li> <li>• master—the port is master</li> </ul>                                                                    |
| Allow Eth-BN        | Indicates whether Ethernet Bandwidth Notification (ETH-BN) is allowed on the port: True or False                                                                                                                                                                                                                                                                                                                              |
| BN Egr.Rate in use  | The egress rate in use based on the request from the ETH-BN server MEP                                                                                                                                                                                                                                                                                                                                                        |
| Eth-BN hold time    | The configured hold time (in seconds) between an egress rate change based on a received Bandwidth Notification Message (BNM) and the next change request that will be accepted                                                                                                                                                                                                                                                |
| Egress Rate         | The maximum amount of egress bandwidth (in kilobits per second) that this Ethernet interface can generate                                                                                                                                                                                                                                                                                                                     |
| Ingress Rate        | The maximum amount of ingress bandwidth (in kilobits per second) that this Ethernet interface can generate                                                                                                                                                                                                                                                                                                                    |
| Down-when-looped    | Enabled: The down-when-looped feature is enabled on the port                                                                                                                                                                                                                                                                                                                                                                  |
|                     | Disabled: The down-when-looped feature is disabled on the port                                                                                                                                                                                                                                                                                                                                                                |
| Keep-alive          | The time interval between keepalive PDUs transmitted toward the network during loop detection by the down-when-looped feature                                                                                                                                                                                                                                                                                                 |
| Loop Detected       | Indicates whether a loop is detected on the port                                                                                                                                                                                                                                                                                                                                                                              |

**Table 59 Show PoE Port Output Fields (Ethernet) (Continued)**

| Label              | Description                                                                                                                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Retry              | The minimum wait time before the port is re-enabled after it is brought down due to a loop detection                                                                                                                |
| Use Broadcast Addr | Indicates whether the down-when-looped feature has been configured to compare the destination MAC address of received PDUs to the broadcast MAC address instead of the MAC address of the port                      |
| Loopback           | The type of loopback configured on the port, either line, internal, or none                                                                                                                                         |
| Swap Mac Addr.     | Indicates whether MAC address swapping is enabled                                                                                                                                                                   |
| Loopback Time Left | The number of seconds left in a timed loopback<br>If there is no loopback configured or the configured loopback is latched, the value is unspecified.<br>If configured loopback is persistent, the value persistent |
| Cfm Loopback       | Indicates whether the CFM loopback is enabled                                                                                                                                                                       |
| PoE Mode           | Indicates whether the port is using Poe, PoE+, or if the PoE function is turned off (disabled)                                                                                                                      |
| PoE Detection      | Indicates the detection state of the PoE port                                                                                                                                                                       |
| PoE Class          | Displays the class of the PoE device connected to the port, as defined in IEEE 802.3af                                                                                                                              |
| PoE Fault Reason   | Displays the reason the PoE port is down if a fault is detected                                                                                                                                                     |
| PoE Maximum Power  | Indicates the maximum amount of PoE power configured and available on the port                                                                                                                                      |
| PoE Power in Use   | Indicates the amount of PoE power being used by the port                                                                                                                                                            |
| Sync. Status Msg.  | Indicates whether Synchronization Status Messaging is enabled on the port                                                                                                                                           |
| Rx Quality Level   | The Synchronization Status Messaging quality level value received on the port                                                                                                                                       |
| PTP Asymmetry      | Indicates whether PTP asymmetry is enabled                                                                                                                                                                          |
| Edge Timestamp     | Indicates whether the edge timestamp is enabled                                                                                                                                                                     |
| Timestamp Capable  | Indicates whether the port is timestamp-capable                                                                                                                                                                     |

**Table 59 Show PoE Port Output Fields (Ethernet) (Continued)**

| Label                     | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CRC Mon SD Thresh         | Indicates the CRC signal degrade threshold value (1 to 9), if enabled                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| CRC Mon SF Thresh         | Indicates the CRC signal fail threshold value (1 to 9), if enabled                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| CRC Mon Window            | Indicates the CRC window sampling size value (1 to 10)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Configured Address        | The base chassis Ethernet MAC address                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Hardware Address          | The interface hardware- or system-assigned MAC address at its protocol sublayer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Cfg Alarm                 | The type of alarms to be logged and reported for the port                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Alarm Status              | The current alarm state                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Traffic Statistics</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Octets input/output       | The total number of octets received and transmitted on the port                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Packets input/output      | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                                                                                                         |
| Errors Input/Output       | <p>For packet-oriented interfaces, the number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol. For character-oriented or fixed-length interfaces, the number of inbound transmission units that contained errors preventing them from being deliverable to a higher-layer protocol.</p> <p>For packet-oriented interfaces, the number of outbound packets that could not be transmitted because of errors. For character-oriented or fixed-length interfaces, the number of outbound transmission units that could not be transmitted because of errors.</p> |

**Table 59 Show PoE Port Output Fields (Ethernet) (Continued)**

| Label                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Port Statistics</b>              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Unicast Packets Input/Output        | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                   |
| Multicast Packets Input/Output      | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a unicast or broadcast address at this sublayer, including those that were discarded or not sent                                                                                                                                                        |
| Broadcast Packets Input/Output      | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or multicast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a unicast or multicast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                       |
| Discards Input/Output               | The number of inbound/outbound packets chosen to be discarded to possibly free up buffer space                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Unknown Proto Discards Input/Output | For packet-oriented interfaces, the number of packets received via the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received via the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0. Unknown proto discards do not show up in the packet counts |
| <b>Port Discard Statistics</b>      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Inv L2 Packets Input                | The number of invalid packets that are discarded due to an unknown Layer 2 ID                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Inv IP Packets Input                | The number of invalid IP packets that are discarded                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| CSM Ingress Queues Input            | The number of incoming control packets discarded                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

**Table 59 Show PoE Port Output Fields (Ethernet) (Continued)**

| Label                                  | Description                                                                                                                                                                                                                                                                                              |
|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CSM Egress Queues Output               | The number of outgoing control packets discarded                                                                                                                                                                                                                                                         |
| <b>Port Control Statistics</b>         |                                                                                                                                                                                                                                                                                                          |
| Ingress Queue CTL                      | The number of forwarded packets and octets, and the number of dropped packets, for the ingress control queue. For access ports, this statistic applies only to Ethernet cards. For network ports, this statistic applies to all adapter cards.                                                           |
| Egress Queue CTL                       | The number of forwarded packets and octets, and the number of dropped packets, for the egress control queue. For access ports, this statistic applies only to Ethernet cards. For network ports, this statistic applies to all adapter cards.                                                            |
| <b>Ethernet-like Medium Statistics</b> |                                                                                                                                                                                                                                                                                                          |
| Alignment Errors                       | The total number of packets received that had a length (excluding framing bits, but including FCS octets) of between 64 and 1518 octets, inclusive, but that had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets |
| FCS Errors                             | The number of frames received that are an integral number of octets in length but do not pass the FCS check                                                                                                                                                                                              |
| SQE Errors                             | The number of times that the SQE TEST ERROR is received                                                                                                                                                                                                                                                  |
| CSE                                    | The number of times that the carrier sense condition was lost or never asserted when attempting to transmit a frame                                                                                                                                                                                      |
| Too long Frames                        | The number of frames received that exceed the maximum permitted frame size                                                                                                                                                                                                                               |
| Symbol Errors                          | For an interface operating at 100 Mb/s, the number of times there was an invalid data symbol when a valid carrier was present                                                                                                                                                                            |
| In Pause Frames                        | The number of IEEE 802.3x pause frames received for flow control; traffic is momentarily disrupted                                                                                                                                                                                                       |
| Sngl Collisions                        | The number of frames that are involved in a single collision, and are subsequently transmitted successfully                                                                                                                                                                                              |
| Mult Collisions                        | The number of frames that are involved in more than one collision and are subsequently transmitted successfully                                                                                                                                                                                          |

**Table 59 Show PoE Port Output Fields (Ethernet) (Continued)**

| Label                          | Description                                                                                                                                                                                                  |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Late Collisions                | The number of times that a collision is detected later than one slotTime into the transmission of a packet                                                                                                   |
| Excess Collisns                | The number of frames for which a transmission fails due to excessive collisions                                                                                                                              |
| Int MAC Tx Errs                | The number of frames for which a transmission fails due to an internal MAC sublayer transmit error                                                                                                           |
| Int MAC Rx Errs                | The number of frames for which a reception fails due to an internal MAC sublayer receive error                                                                                                               |
| Out Pause Frames               | The number of IEEE 802.3x pause frames sent for flow control; traffic is momentarily disrupted                                                                                                               |
| <b>Ethernet CFM Statistics</b> |                                                                                                                                                                                                              |
| Cfm LbmRx                      | The number of LBMs received                                                                                                                                                                                  |
| Cfm LbReplyTx                  | The number of LBRs transmitted                                                                                                                                                                               |
| Cfm LbmDropped                 | The number of LBMs dropped                                                                                                                                                                                   |
| Num Bn Rate Chng               | The number of times that the port egress rate is dynamically changed based on Bandwidth Notification (BN) messages<br>Note: not every bandwidth change indicated by a BNM triggers a port egress rate change |
| Last BnRateChng                | The time that the port egress rate was last changed based on a BNM                                                                                                                                           |
| Valid BnmRx                    | The number of valid BN messages received                                                                                                                                                                     |
| Last Valid BnmRx               | The time that the last valid BNM was received                                                                                                                                                                |
| Invalid BnmRx                  | The number of invalid BN messages received                                                                                                                                                                   |
| BnmOutOfRangeBW                | The number of BN messages received with a requested bandwidth that was out of range                                                                                                                          |

**Output Example**

```

*A:ALU-1># show port 1/1/1
=====
Serial RS-232 Physical Interface
=====
Description : RS-232/V.35/X.21
Interface : 1/1/1
Admin Status : down
Physical Link : No
Port IfIndex : 35684352
Oper Status : down

```

```

Type : rs232
=====
Port Statistics
=====
 Input Output

Packets 0 0
Discards 0 0
Unknown Proto Discards 0
=====
*A:ALU-1>#

```

**Table 60** Show Specific Port Output Fields (Serial Port)

| Label                                   | Description                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Serial RS-232 Physical Interface</b> |                                                                                                                                                                                                                                                                                                                                                                                 |
| Description                             | A text description of the port                                                                                                                                                                                                                                                                                                                                                  |
| Interface                               | The port ID displayed in the <i>slot/mda/port</i> format                                                                                                                                                                                                                                                                                                                        |
| Port IfIndex                            | The interface's index number, which reflects its initialization sequence                                                                                                                                                                                                                                                                                                        |
| Admin Status                            | up: the administrative state is up                                                                                                                                                                                                                                                                                                                                              |
|                                         | down: the administrative state is down                                                                                                                                                                                                                                                                                                                                          |
| Oper Status                             | up: the operational state is up                                                                                                                                                                                                                                                                                                                                                 |
|                                         | down: the operational state is down                                                                                                                                                                                                                                                                                                                                             |
| Physical Link                           | Yes: a physical link is present                                                                                                                                                                                                                                                                                                                                                 |
|                                         | No: a physical link is not present                                                                                                                                                                                                                                                                                                                                              |
| Type                                    | The type of serial interface                                                                                                                                                                                                                                                                                                                                                    |
| <b>Port Statistics</b>                  |                                                                                                                                                                                                                                                                                                                                                                                 |
| Packets input/output                    | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent. |
| Discards input/output                   | The number of inbound/outbound packets chosen to be discarded to possibly free up buffer space                                                                                                                                                                                                                                                                                  |



**Table 60 Show Specific Port Output Fields (Serial Port) (Continued)**

| Label                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Unknown proto discards input/output | For packet-oriented interfaces, the number of packets received at the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received at the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0. |

**Output Example**

```

*A:ALU-1># show port 1/2/1
=====
SONET/SDH Interface
=====
Description : OC-3 SONET/SDH
Interface : 1/2/1 Speed : oc3
Admin Status : up Oper Status : up
Physical Link : Yes Loopback Mode : none
Single Fiber Mode : No
Ing. Pool % Rate : 100 Egr. Pool % Rate : 100
APS Group : none APS Role : none
Clock Source : node Framing : sonet
Last State Change : 11/24/2009 13:05:56 Port IfIndex : 46170112
Last Cleared Time : N/A DDM Events : Enabled
J0 String : 0x01 Section Trace Mode : byte
Rx S1 Byte : 0x00 (stu) Rx K1/K2 Byte : 0x00/0x00
Tx S1 Byte : 0x00 (stu) Tx DUS/DNU : Disabled
Rx J0 String (Hex) : 01 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
Cfg Alarm : loc lrdi lb2er-sf slof slos
Alarm Status :
BER SD Threshold : 6 BER SF Threshold : 3
Hold time up : 500 milliseconds
Hold time down : 0 milliseconds
Transceiver Type : SFP
Model Number : 3HE00034AAAA02 ALU IPUIAEXDAB
TX Laser Wavelength: 1310 nm Diag Capable : yes
Connector Code : LC Vendor OUI : 00:00:00
Manufacture date : 2009/04/25 Media : SONET/SDH
Serial Number : 1XX200083926037
Part Number : FTM3101CSL2iAL
Optical Compliance : OC3-SR-MM
Link Length support: 2000m for 50u MMF; 2000m for 62.5u MMF
SFP Sync-E Capable : n/a
=====
Transceiver Digital Diagnostic Monitoring (DDM), Externally Calibrated
=====
Value High Alarm High Warn Low Warn Low Alarm

Temperature (C) +36.6 +100.0 +95.0 -35.0 -40.0
Supply Voltage (V) 3.28 3.80 3.63 2.97 2.70

```

```

Tx Bias Current (mA) 8.2 60.0 50.0 0.2 0.1
Tx Output Power (dBm) -15.44 -13.00 -14.00 -20.00 -21.02
Rx Optical Power (avg dBm) -16.14 -9.00 -10.00 -33.00 -35.22
=====
Port Statistics
=====
 Input Output

Packets 0 0
Discards 0 0
Unknown Proto Discards 0
=====
*A:ALU-1># show

```

**Table 61** Show Specific Port Output Fields (SONET/SDH Port)

| Label                      | Description                                                                                                                                           |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SONET/SDH interface</b> |                                                                                                                                                       |
| Description                | A text description of the port                                                                                                                        |
| Interface                  | The port ID displayed in the <i>slot/mda/port</i> format                                                                                              |
| Speed                      | The speed of a SONET/SDH port                                                                                                                         |
| Admin Status               | up: the administrative state is up                                                                                                                    |
|                            | down: the administrative state is down                                                                                                                |
| Oper Status                | up: the operational state is up                                                                                                                       |
|                            | down: the operational state is down                                                                                                                   |
| Physical Link              | Yes: a physical link is present                                                                                                                       |
|                            | No: a physical link is not present                                                                                                                    |
| Loopback Mode              | The loopback mode on the port                                                                                                                         |
| Single Fiber Mode          | Yes: single fiber mode                                                                                                                                |
|                            | No: not single fiber mode                                                                                                                             |
| Ing. Pool % Rate           | The amount of ingress buffer space, expressed as a percentage of the available buffer space, that will be allocated to the port for ingress buffering |
| Egr. Pool % Rate           | The amount of egress buffer space, expressed as a percentage of the available buffer space, that will be allocated to the port for egress buffering   |
| APS group                  | The automatic protection switching group                                                                                                              |
| APS role                   | The automatic protection switching group role                                                                                                         |

**Table 61 Show Specific Port Output Fields (SONET/SDH Port) (Continued)**

| Label              | Description                                                                                                                                                                                                              |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Clock Source       | node: the link uses the internal clock when transmitting data<br>loop: the link recovers the clock from the received data stream                                                                                         |
| Framing            | sonet: the port is configured for SONET framing<br>sdh: the port is configured for SDH framing                                                                                                                           |
| Last State Change  | The last time that the operational status of the port changed state                                                                                                                                                      |
| Port IfIndex       | The interface's index number, which reflects its initialization sequence                                                                                                                                                 |
| Last Cleared Time  | The time since the last clear                                                                                                                                                                                            |
| DDM Events         | Enabled: digital diagnostic monitoring events is enabled for the port<br>Disabled: digital diagnostic monitoring events is disabled for the port                                                                         |
| J0 String          | The section trace value that is sent to the far-end port                                                                                                                                                                 |
| Section Trace Mode | byte: the section trace in the SONET section header is set in bytes<br>string: a text string is used to identify the SONET section header<br>increment-z0: an incremental STM ID is configured instead of a static value |
| Rx S1 Byte         | The synchronization status message value of the received SONET/SDH S1 byte                                                                                                                                               |
| Rx K1/K2 Byte      | The value of the received SONET/SDH K1/K2 byte                                                                                                                                                                           |
| Tx S1 Byte         | The synchronization status message value of the transmitted SONET/SDH S1 byte                                                                                                                                            |
| Tx DUS/DNU         | Indicates whether the transmission of the QL-DUS/DNU value in synchronization status messages is enabled or disabled on the port                                                                                         |
| Rx J0 String (Hex) | The hex value of the received J0                                                                                                                                                                                         |
| Cfg Alarm          | The type of alarms to be logged and reported for the SONET/SDH port                                                                                                                                                      |
| Alarm Status       | The current alarm state                                                                                                                                                                                                  |

**Table 61 Show Specific Port Output Fields (SONET/SDH Port) (Continued)**

| Label            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| BER SD Threshold | The configured threshold for line signal degradation BER error rate, that when crossed determines the signal degradation and signal failure                                                                                                                                                                                                                                                                                                                                                             |
| BER SF Threshold | The configured threshold for line signal failure BER error rate, that when crossed determines the signal degradation and signal failure                                                                                                                                                                                                                                                                                                                                                                 |
| Hold time up     | The hold-timer value for link-up event dampening                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Hold time down   | The hold-timer value for link-down event dampening                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Transceiver Type | SFP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                  | <p>The following information is provided for a configured SFP:</p> <ul style="list-style-type: none"> <li>• model number</li> <li>• TX laser wavelength</li> <li>• whether it is diagnostics capable</li> <li>• connector code</li> <li>• vendor organizationally unique identifier (OUI)</li> <li>• manufacture date</li> <li>• media</li> <li>• serial number</li> <li>• part number</li> <li>• optical compliance</li> <li>• link length support:</li> <li>• whether it is Sync-E capable</li> </ul> |

**Table 61 Show Specific Port Output Fields (SONET/SDH Port) (Continued)**

| Label                                                                         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Transceiver Digital Diagnostic Monitoring (DDM), Externally Calibrated</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                               | <p>SFP manufacturers specifications guidelines contained in specification SFF-8472, for the following:</p> <ul style="list-style-type: none"> <li>• temperature (C)</li> <li>• supply voltage (V)</li> <li>• Tx bias current (mA)</li> <li>• Tx output power (dBm)</li> <li>• Rx optical power (avg dBm)</li> </ul> <p>For the above categories, the following values are shown:</p> <ul style="list-style-type: none"> <li>• Value is the current measured value of each variable</li> <li>• High Alarm is the measurement of Value that will cause a DDM High Alarm to be output</li> <li>• High Warn is the measurement of Value that will cause a DDM High Warning Alarm to be output</li> <li>• Low Warn is the measurement of Value that will cause a DDM Low Warning Alarm to be output</li> <li>• Low Alarm is the measurement of Value that will cause a DDM Low Alarm to be output</li> </ul> <p>If alarms/warnings are raised, an "!" is included in the output</p> |
| <b>Port Statistics</b>                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Packets Input/Output                                                          | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Discards Input/Output                                                         | The number of inbound/outbound packets chosen to be discarded to possibly free up buffer space                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

**Table 61**      **Show Specific Port Output Fields (SONET/SDH Port) (Continued)**

| Label                                  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Unknown proto discards<br>Input/Output | For packet-oriented interfaces, the number of packets received at the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received at the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0. |

Output Example

```
*A:ALU-1># show port 1/1/1
=====
Voice Physical Interface
=====
Description : E&M
Interface : 1/1/1 Port IfIndex : 41975808
Admin Status : up Oper Status : up
Physical Link : Yes
Type : em
TLP Rx : 0.0 Audio Wires : four-wires
TLP Tx : 0.0
=====

Port Statistics
=====
-----+-----+-----
 Input Output
-----+-----+-----
Packets 106012 105984
Discards 0 0
Unknown Proto Discards 0
=====
*A:ALU-1>#
```

Table 62 Show Specific Port Output Fields (E&M Voice Port)

| Label                    | Description                                                              |
|--------------------------|--------------------------------------------------------------------------|
| Voice Physical Interface |                                                                          |
| Description              | A text description of the port                                           |
| Interface                | The port ID displayed in the <i>slot/mda/port</i> format                 |
| Port IfIndex             | The interface's index number, which reflects its initialization sequence |
| Admin Status             | up: the administrative state is up                                       |
|                          | down: the administrative state is down                                   |
| Oper Status              | up: the operating state is up                                            |
|                          | down: the operating state is down                                        |
| Physical Link            | Yes: a physical link is present                                          |
|                          | No: a physical link is not present                                       |
| Type                     | The type of voice interface                                              |
| TLP Rx                   | The receive transmission level point value for the port                  |
| Audio Wires              | Four-wire or two-wire (for E & M only)                                   |

**Table 62 Show Specific Port Output Fields (E&M Voice Port) (Continued)**

| Label                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TLP Tx                              | The transmit transmission level point value for the port                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Port Statistics</b>              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Packets Input/Output                | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent.                                                                                      |
| Discards Input/Output               | The number of inbound/outbound packets chosen to be discarded to possibly free up buffer space                                                                                                                                                                                                                                                                                                                                                                       |
| Unknown Proto Discards Input/Output | For packet-oriented interfaces, the number of packets received at the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received at the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0. |

**Output Example**

```

*A:ALU-1># show port 1/1/5
=====
Voice Physical Interface
=====
Description : FXO
Interface : 1/1/5 Port IfIndex : 39878656
Admin Status : down Oper Status : down
Physical Link : no
Type : fxo Signaling Type : 3600ls
TLP Rx : 0.0 Line Balance : nominal
TLP Tx : 0.0
=====
Port Statistics
=====
 Input Output

Packets 0 0
Discards 0 0
Unknown Proto Discards 0
=====
*A:ALU-1>#

```



**Table 63 Show Specific Port Output Fields (FXO Voice Port)**

| Label                           | Description                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Voice Physical Interface</b> |                                                                                                                                                                                                                                                                                                                                                                                 |
| Description                     | A text description of the port                                                                                                                                                                                                                                                                                                                                                  |
| Interface                       | The port ID displayed in the <i>slot/mda/port</i> format                                                                                                                                                                                                                                                                                                                        |
| Port IfIndex                    | The interface's index number, which reflects its initialization sequence                                                                                                                                                                                                                                                                                                        |
| Admin Status                    | up: the administrative state is up                                                                                                                                                                                                                                                                                                                                              |
|                                 | down: the administrative state is down                                                                                                                                                                                                                                                                                                                                          |
| Oper Status                     | up: the operating state is up                                                                                                                                                                                                                                                                                                                                                   |
|                                 | down: the operating state is down                                                                                                                                                                                                                                                                                                                                               |
| Physical Link                   | Yes: a physical link is present                                                                                                                                                                                                                                                                                                                                                 |
|                                 | No: a physical link is not present                                                                                                                                                                                                                                                                                                                                              |
| Type                            | The type of voice interface (fxo)                                                                                                                                                                                                                                                                                                                                               |
| Signaling Type                  | Loop Start (ls) or Loop Calling Disconnect Clear (lcdc)                                                                                                                                                                                                                                                                                                                         |
| TLP Rx                          | The receive transmission level point value for the port                                                                                                                                                                                                                                                                                                                         |
| Line Balance                    | nominal or 800                                                                                                                                                                                                                                                                                                                                                                  |
| TLP Tx                          | The transmit transmission level point value for the port                                                                                                                                                                                                                                                                                                                        |
| <b>Port Statistics</b>          |                                                                                                                                                                                                                                                                                                                                                                                 |
| Packets Input/Output            | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent. |
| Discards Input/Output           | The number of inbound/outbound packets chosen to be discarded to possibly free up buffer space                                                                                                                                                                                                                                                                                  |

**Table 63 Show Specific Port Output Fields (FXO Voice Port) (Continued)**

| Label                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Unknown Proto Discards Input/Output | For packet-oriented interfaces, the number of packets received at the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received at the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0. |

**Output Example**

```

*A:ALU-1># show port 1/6/1
=====
Voice Physical Interface
=====
Description : FXO
Interface : 1/1/5 Port IfIndex : 39878656
Admin Status : down Oper Status : down
Physical Link : no
Type : fxs Signaling Type : 3600ls
TLP Rx : -3.0 Line Balance : nominal
TLP Tx : 0.0 Ring Generation : 16
=====
Port Statistics
=====
 Input Output

Packets 0 0
Discards 0 0
Unknown Proto Discards 0
=====
*A:ALU-1>#

```

**Table 64 Show Specific Port Output Fields (FXS Voice Port)**

| Label                           | Description                                                              |
|---------------------------------|--------------------------------------------------------------------------|
| <b>Voice Physical Interface</b> |                                                                          |
| Description                     | A text description of the port                                           |
| Interface                       | The port ID displayed in the <i>slot/mda/port</i> format                 |
| Port IfIndex                    | The interface's index number, which reflects its initialization sequence |

**Table 64 Show Specific Port Output Fields (FXS Voice Port) (Continued)**

| Label                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Admin Status                        | up: the administrative state is up                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                     | down: the administrative state is down                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Oper Status                         | up: the operating state is up                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                     | down: the operating state is down                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Physical Link                       | Yes: a physical link is present                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                     | No: a physical link is not present                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Type                                | The type of voice interface (fxs)                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Signaling Type                      | Loop Start (ls) or Loop Calling Disconnect Clear (lcdc)                                                                                                                                                                                                                                                                                                                                                                                                              |
| TLP Rx                              | The receive transmission level point value for the port                                                                                                                                                                                                                                                                                                                                                                                                              |
| Line Balance                        | nominal or 800                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| TLP Tx                              | The transmit transmission level point value for the port                                                                                                                                                                                                                                                                                                                                                                                                             |
| Ring Generation                     | The frequency of the generated ring signal                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Port Statistics</b>              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Packets Input/Output                | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent.                                                                                      |
| Discards Input/Output               | The number of inbound/outbound packets chosen to be discarded to possibly free up buffer space                                                                                                                                                                                                                                                                                                                                                                       |
| Unknown Proto Discards Input/Output | For packet-oriented interfaces, the number of packets received at the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received at the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0. |

**Output Example**

```

*A:ALU-1># show port 1/6/1.1
=====
Voice DS0 Chan Group
=====
Description : DS0GRP
Interface : 1/6/1.1
Admin Status : down Oper Status : down
Last State Change : 01/31/2011 16:06:07 Chan-Grp IfIndex : 572555325
Configured Mode : access Encap Type : cem
Admin MTU : 1514 Oper MTU : 1514
Physical Link : No
=====
Traffic Statistics
=====
 Input Output

Octets 0 0
Packets 0 0
Errors 0 0
=====
Port Statistics
=====
 Input Output

Packets 0 0
Discards 0 0
Unknown Proto Discards 0
=====

```

**Table 65 Show Specific Port Output Fields (DS0 Voice Channel Group)**

| Label             | Description                                                                  |
|-------------------|------------------------------------------------------------------------------|
| <b>Voice</b>      |                                                                              |
| Description       | A text description of the port                                               |
| Interface         | The port ID displayed in the <i>slot/mda/port</i> format                     |
| Admin Status      | up: the administrative state is up                                           |
|                   | down: the administrative state is down                                       |
| Oper Status       | up: the operating state is up                                                |
|                   | down: the operating state is down                                            |
| Chan-grp IfIndex  | The channel group's index number, which reflects its initialization sequence |
| Last State Change | Date and time of last state change                                           |
| Configured Mode   | short, long, nominal or 800                                                  |

**Table 65 Show Specific Port Output Fields (DS0 Voice Channel Group)**

| Label                     | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Admin MTU                 | The configured MTU                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Physical Link             | Yes: a physical link is present                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                           | No: a physical link is not present                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Encap Type                | The transmit transmission level point value for the port                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Oper MTU                  | The negotiated size of the largest packet that can be sent on the port or channel specified in octets                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Traffic Statistics</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Octets Input/Output       | The total number of octets received and transmitted on the port                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Packets Input/Output      | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                                                                                                         |
| Errors Input/Output       | <p>For packet-oriented interfaces, the number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol. For character-oriented or fixed-length interfaces, the number of inbound transmission units that contained errors preventing them from being deliverable to a higher-layer protocol.</p> <p>For packet-oriented interfaces, the number of outbound packets that could not be transmitted because of errors. For character-oriented or fixed-length interfaces, the number of outbound transmission units that could not be transmitted because of errors.</p> |
| <b>Port Statistics</b>    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Packets Input/Output      | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                                                                                                         |
| Discards Input/Output     | The number of inbound/outbound packets chosen to be discarded to possibly free up buffer space                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

**Table 65 Show Specific Port Output Fields (DS0 Voice Channel Group)**

| Label                                  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Unknown proto discards<br>Input/Output | For packet-oriented interfaces, the number of packets received at the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received at the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0. |

**Output Example**

```
*A:ALU-1># show port 1/2/2 detail
=====
SONET/SDH Interface
=====
Description : OC-3 SONET/SDH
Interface : 1/2/2 Speed : oc3
Admin Status : up Oper Status : up
Physical Link : Yes Loopback Mode : none
Single Fiber Mode : No
Ing. Pool % Rate : 100 Egr. Pool % Rate : 100
APS Group : none APS Role : none
Clock Source : node Framing : sonet
Last State Change : 12/02/2009 11:14:23 Port IfIndex : 46170112
Last Cleared Time : N/A DDM Events : Enabled
J0 String : 0x01 Section Trace Mode : byte
Rx S1 Byte : 0x00 (stu) Rx K1/K2 Byte : 0x00/0x00
Tx S1 Byte : 0x00 (stu) Tx DUS/DNU : Disabled
Rx J0 String (Hex) : 01 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
Cfg Alarm : loc lrdi lb2er-sf slof slos
Alarm Status :
BER SD Threshold : 6 BER SF Threshold : 3
Hold time up : 500 milliseconds
Hold time down : 0 milliseconds
Transceiver Type : SFP
Model Number : 3HE00034AAAA02 ALU IPUIAEXDAB
TX Laser Wavelength: 1310 nm Diag Capable : yes
Connector Code : LC Vendor OUI : 00:00:00
Manufacture date : 2009/04/25 Media : SONET/SDH
Serial Number : 1XX200083926037
Part Number : FTM3101CSL2iAL
Optical Compliance : OC3-SR-MM
Link Length support: 2000m for 50u MMF; 2000m for 62.5u MMF
SFP Sync-E Capable : n/a
=====
Sonet Section
=====
ES-S : 2
SES-S : 1
SEFS-S : 0
CV-S : 65561
```

```

LOS : 0
LOC : 0
LOF : 0
OOF : 0
B1 Error : 0
=====
Sonet Line
=====
 Far End

ES-L : 2 3
SES-L : 1 3
UAS-L : 0 0
CV-L : 49425 0
AIS-L : 0
RDI-L : 1
B2 Error : 0
S1 Error : 0
M1 Error : 24834
=====
Port Statistics
=====
 Input Output

Packets 0 0
Discards 0 0
Unknown Proto Discards 0
=====
*A:ALU-1>#

```

**Table 66** Show Port Detail Output Fields (SONET/SDH Port)

| Label                      | Description                                              |
|----------------------------|----------------------------------------------------------|
| <b>SONET/SDH interface</b> |                                                          |
| Description                | A text description of the port                           |
| Interface                  | The port ID displayed in the <i>slot/mda/port</i> format |
| Speed                      | The speed of a SONET/SDH port                            |
| Admin Status               | up: the administrative state is up                       |
|                            | down: the administrative state is down                   |
| Oper Status                | up: the operational state is up                          |
|                            | down: the operational state is down                      |
| Physical Link              | Yes: a physical link is present                          |
|                            | No: a physical link is not present                       |
| Loopback Mode              | The loopback mode on the port                            |

**Table 66 Show Port Detail Output Fields (SONET/SDH Port) (Continued)**

| Label              | Description                                                                                                                                                                                                              |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Single Fiber Mode  | Yes: single fiber mode<br>No: not single fiber mode                                                                                                                                                                      |
| Ing. Pool % Rate   | The amount of ingress buffer space, expressed as a percentage of the available buffer space, that will be allocated to the port for ingress buffering                                                                    |
| Egr. Pool % Rate   | The amount of egress buffer space, expressed as a percentage of the available buffer space, that will be allocated to the port for egress buffering                                                                      |
| Clock Source       | node: the link uses the internal clock when transmitting data<br>loop: the link recovers the clock from the received data stream                                                                                         |
| Framing            | sonet: the port is configured for SONET framing<br>sdh: the port is configured for SDH framing                                                                                                                           |
| Last State Change  | The last time that the operational status of the port changed state                                                                                                                                                      |
| Port IfIndex       | The interface's index number, which reflects its initialization sequence                                                                                                                                                 |
| Last Cleared Time  | The time since the last clear                                                                                                                                                                                            |
| DDM Events         | Enabled: digital diagnostic monitoring events is enabled for the port<br>Disabled: digital diagnostic monitoring events is disabled for the port                                                                         |
| J0 String          | The section trace value that is sent to the far-end port                                                                                                                                                                 |
| Section Trace Mode | byte: the section trace in the SONET section header is set in bytes<br>string: a text string is used to identify the SONET section header<br>increment-z0: an incremental STM ID is configured instead of a static value |
| Rx S1 Byte         | The synchronization status message value of the received SONET/SDH S1 byte                                                                                                                                               |
| Rx K1/K2 Byte      | The value of the received SONET/SDH K1/K2 byte                                                                                                                                                                           |
| Tx S1 Byte         | The synchronization status message value of the transmitted SONET/SDH S1 byte                                                                                                                                            |



**Table 66 Show Port Detail Output Fields (SONET/SDH Port) (Continued)**

| Label                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Tx DUS/DNU           | Indicates whether the transmission of the QL-DUS/DNU value in synchronization status messages is enabled or disabled on the port                                                                                                                                                                                                                                                                                                                                                                        |
| Rx J0 String (Hex)   | The hex value of the received J0                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Cfg Alarm            | The type of alarms to be logged and reported for the SONET/SDH port                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Alarm Status         | The current alarm state                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| BER SD Threshold     | The configured threshold for line signal degradation BER error rate, that when crossed determines the signal degradation and signal failure                                                                                                                                                                                                                                                                                                                                                             |
| BER SF Threshold     | The configured threshold for line signal failure BER error rate, that when crossed determines the signal degradation and signal failure                                                                                                                                                                                                                                                                                                                                                                 |
| Hold time up         | The hold-timer value for link-up event dampening                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Hold time down       | The hold-timer value for link-down event dampening                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                      | <p>The following information is provided for a configured SFP:</p> <ul style="list-style-type: none"> <li>• model number</li> <li>• TX laser wavelength</li> <li>• whether it is diagnostics capable</li> <li>• connector code</li> <li>• vendor organizationally unique identifier (OUI)</li> <li>• manufacture date</li> <li>• media</li> <li>• serial number</li> <li>• part number</li> <li>• optical compliance</li> <li>• link length support:</li> <li>• whether it is Sync-E capable</li> </ul> |
| <b>Sonet Section</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| ES-S                 | The number of Errored Seconds errors                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| SES-S                | The number of Severely Errored Seconds errors                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| SEFS-S               | The number of Severely Errored Framing Seconds errors                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| CV-S                 | The number of Code Violations errors                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

**Table 66 Show Port Detail Output Fields (SONET/SDH Port) (Continued)**

| Label                  | Description                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| LOS                    | The number of Loss of Signal errors                                                                                                                                                                                                                                                                                                                                             |
| LOC                    | The number of Loss of Clock errors                                                                                                                                                                                                                                                                                                                                              |
| LOF                    | The number of Loss of Frame errors                                                                                                                                                                                                                                                                                                                                              |
| OOF                    | The number of Out of Frame errors                                                                                                                                                                                                                                                                                                                                               |
| B1 Error               | The number of B1 errors                                                                                                                                                                                                                                                                                                                                                         |
| <b>Sonet Line</b>      |                                                                                                                                                                                                                                                                                                                                                                                 |
| ES-L                   | The number of Errored Seconds errors, at the near end and far end                                                                                                                                                                                                                                                                                                               |
| SES-L                  | The number of Severely Errored Seconds errors, at the near end and far end                                                                                                                                                                                                                                                                                                      |
| UAS-L                  | The number of Unavailable Seconds errors, at the near end and far end                                                                                                                                                                                                                                                                                                           |
| CV-L                   | The number of Code Violations errors, at the near end and far end                                                                                                                                                                                                                                                                                                               |
| AIS-L                  | The number of Alarm Indication Signal errors                                                                                                                                                                                                                                                                                                                                    |
| RDI-L                  | The number of Remote Defect Indication errors                                                                                                                                                                                                                                                                                                                                   |
| B2 Error               | The number of B2 errors                                                                                                                                                                                                                                                                                                                                                         |
| S1 Error               | The number of S1 errors                                                                                                                                                                                                                                                                                                                                                         |
| M1 Error               | The number of M1 errors                                                                                                                                                                                                                                                                                                                                                         |
| <b>Port Statistics</b> |                                                                                                                                                                                                                                                                                                                                                                                 |
| Packets Input/Output   | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent. |
| Discards Input/Output  | The number of inbound/outbound packets chosen to be discarded to possibly free up buffer space                                                                                                                                                                                                                                                                                  |

**Table 66 Show Port Detail Output Fields (SONET/SDH Port) (Continued)**

| Label                                  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Unknown proto discards<br>Input/Output | For packet-oriented interfaces, the number of packets received at the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received at the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0. |

**Ethernet Output Example (access mode)**

```

*A:ALU-1># show port 1/5/8 detail
=====
Ethernet Interface
=====
Description : 10/100/Gig Ethernet SFP
Interface : 1/5/8 Oper Speed : 1 Gbps
Link-level : Ethernet Config Speed : 1 Gbps
Admin State : up Oper Duplex : full
Oper State : up Config Duplex : full
Physical Link : Yes MTU : 1518
Single Fiber Mode : No
IfIndex : 44302336 Hold time up : 0 seconds
Last State Change : 10/04/2011 14:05:25 Hold time down : 0 seconds
Last Cleared Time : 10/04/2011 14:04:37 DDM Events : Enabled
Phys State Chng Cnt: 3

Configured Mode : access Encap Type : 802.1q
Dot1Q Ethertype : 0x8100 QinQ Ethertype : 0x8100
Ing. Pool % Rate : 100 Egr. Pool % Rate : 100
Net. Egr. Queue Pol: default
Auto-negotiate : true MDI/MDX : MDX
Net. Scheduler Mode: 16-priority
Config Phy-tx-clock: auto-pref-slave Oper Phy-tx-clock: slave
SapEgr.Unshaped-Cir: 0 Kbps
SapEgr.Shaper-Pol : EgrShprPolicy
NetEgr.Unshaped-Cir: 0 Kbps
Allow Eth-BN : True
BN Egr.Rate in use : 765000 Eth-BN hold time : 6
Egress Rate : 1111 Ingress Rate : n/a
Egr.Rate Incl.FCS : Disabled
Ingress CBS(bytes) : 130816 Src-pause : Disabled
 LACP Tunnel : Disabled

Down-when-looped : Disabled Keep-alive : 10
Loop Detected : False Retry : 120
Use Broadcast Addr : False

Loopback : none Swap Mac Addr : Disabled
Loopback Time Left : unspecified
Cfm Loopback : Disabled

```

```

Sync. Status Msg. : Disabled
Rx Quality Level : N/A

PTP Asymmetry : 0
Timestamp Capable : False
Edge Timestamp : Disable

```

```

Configured Address : 6c:be:e9:b1:af:1b
Hardware Address : 6c:be:e9:b1:af:1b
Cfg Alarm :
Alarm Status :

```

#### Transceiver Data

```

Transceiver Type : SFP
Model Number : 3HE00062AAAA01 ALA IPU1AEHDAA
TX Laser Wavelength: 0 nm
Connector Code : Unknown
Manufacture date : 2010/01/15
Serial Number : PH23PQS
Part Number : FCMJ-8521-3-A5
Optical Compliance : GIGE-T
Link Length support: 100m for copper
SFP Sync-E Capable : no

```

#### Traffic Statistics

|         | Input | Output |
|---------|-------|--------|
| Octets  | 10728 | 14236  |
| Packets | 102   | 156    |
| Errors  | 0     | 0      |

#### Ethernet Statistics

|                   |    |                    |   |
|-------------------|----|--------------------|---|
| Broadcast Pckts : | 3  | Drop Events :      | 0 |
| Multicast Pckts : | 52 | CRC/Align Errors : | 0 |
| Undersize Pckts : | 0  | Fragments :        | 0 |
| Oversize Pckts :  | 0  | Jabbers :          | 0 |
| Collisions :      | 0  |                    |   |

|                                  |       |
|----------------------------------|-------|
| Octets :                         | 24964 |
| Packets :                        | 258   |
| Packets of 64 Octets :           | 54    |
| Packets of 65 to 127 Octets :    | 204   |
| Packets of 128 to 255 Octets :   | 0     |
| Packets of 256 to 511 Octets :   | 0     |
| Packets of 512 to 1023 Octets :  | 0     |
| Packets of 1024 to 1518 Octets : | 0     |
| Packets of 1519 or more Octets : | 0     |

#### Port Statistics

|                 | Input | Output |
|-----------------|-------|--------|
| Unicast Packets | 102   | 101    |

```

Multicast Packets 0 52
Broadcast Packets 0 3
Discards 0 0
Unknown Proto Discards 0
=====

Port Discard Statistics
=====
 Input Output
Inv L2 Packets : 0 Port MTU Exceeded: 0
Inv MPLS Labels : 0
Inv IP Packets : 0

CSM Ingress Queues CSM Egress Queues
 Hi : 0 Common : 0
 Medium : 0
 Low : 0
=====

Port Control Statistics
=====

Ingress Queue CTL Packets Octets
 Forwarded : 102 13482
 Dropped : 0 N/A

Egress Queue CTL Packets Octets
 Forwarded : 56 3184
 Dropped : 0 N/A
=====

Ethernet CFM Statistics
=====

Cfm LbmRx : 0
Cfm LbReplyTx : 0 Cfm LbmDropped : 0

Num Bn Rate Chng : 1 Last BnRateChng : 04/12/2017 21:20:53
Valid BnmRx : 2 Last Valid BnmRx : 04/12/2017 21:21:10
Invalid BnmRx : 0
BnmOutOfRangeBW : 0
=====

Ethernet-like Medium Statistics
=====

Alignment Errors : 0 Sngl Collisions : 0
FCS Errors : 0 Mult Collisions : 0
SQE Test Errors : 0 Late Collisions : 0
CSE : 0 Excess Collisns : 0
Too long Frames : 0 Int MAC Tx Errs : 0
Symbol Errors : 0 Int MAC Rx Errs : 0
In Pause Frames : 0 Out Pause Frames : 0
=====

```

**Table 67 Show Port Detail Output Fields (Ethernet, Access Mode)**

| Label                     | Description                                                                                                                                               |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Ethernet Interface</b> |                                                                                                                                                           |
| Description               | A text description of the port                                                                                                                            |
| Interface                 | The port ID displayed in the <i>slot/mda/port</i> format                                                                                                  |
| Oper Speed                | The operating speed of the interface                                                                                                                      |
| Link-level                | Ethernet: the port is configured as Ethernet                                                                                                              |
| Config Speed              | The configured speed of the interface                                                                                                                     |
| Admin State               | up: the port is administratively up                                                                                                                       |
|                           | down: the port is administratively down                                                                                                                   |
| Oper Duplex               | The operating duplex mode of the interface                                                                                                                |
| Oper State                | up: the port is operationally up                                                                                                                          |
|                           | down: the port is operationally down                                                                                                                      |
| Config Duplex             | full: the link is configured to full-duplex mode                                                                                                          |
|                           | half: the link is configured to half-duplex mode                                                                                                          |
| Physical Link             | Yes: a physical link is present                                                                                                                           |
|                           | No: a physical link is not present                                                                                                                        |
| MTU                       | The size of the largest packet that can be sent/received on the Ethernet physical interface, specified in octets                                          |
| IfIndex                   | The interface's index number, which reflects its initialization sequence                                                                                  |
| Hold time up              | The link-up dampening time in seconds. The port link dampening timer value that reduces the number of link transitions reported to upper layer protocols. |
| Last State Change         | The last time that the operational status of the port changed state                                                                                       |
| Hold time down            | The link-down dampening time in seconds. The down timer controls the dampening timer for link down transitions.                                           |

**Table 67 Show Port Detail Output Fields (Ethernet, Access Mode)**

| Label                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Phys State Chng Cnt  | <p>The physical state change counter. This counter increments when a fully qualified (debounced) transition occurs at the physical layer of an Ethernet port, including the following transitions of the port state as displayed in the <b>show port slot/mda/port</b> output:</p> <ul style="list-style-type: none"> <li>• from Down to Link Up or Up</li> <li>• from Link Up or Up to Down</li> </ul> <p>This counter does not increment for changes only in the link protocol states. That is, if the physical link is up, any transitions of the port state due to link protocols (for example, 802.3ah EFM OAM, LACP, 802.1ag) do not cause the counter to increment. The following port state transitions are examples of transitions that are not counted:</p> <ul style="list-style-type: none"> <li>• from Link Up to Up</li> <li>• from Up to Link Up</li> </ul> |
| Configured Mode      | network: the port is configured for transport network use                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                      | access: the port is configured for service access                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                      | hybrid: the port is configured for hybrid use (transport network and service access per VLAN)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Encap Type           | null: ingress frames will not use any tags or labels to delineate a service                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                      | dot1q: ingress frames carry 802.1Q tags, where each tag signifies a different service                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                      | qinq: ingress frames carry two 802.1Q tags, where the outer tag is the service provider tag and the inner tag is the customer service tag                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Dot1Q Ethertype      | The protocol carried in a dot1q Ethernet frame                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| QinQ Ethertype       | The protocol carried in a qinq Ethernet frame                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Net. Egr. Queue Pol. | The number of the associated network egress queue QoS policy, or default if the default policy is used                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Auto-negotiate       | true: the link attempts to automatically negotiate the link speed and duplex parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                      | false: the duplex and speed values are used for the link                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Net. Scheduler Mode  | The network scheduler mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

**Table 67 Show Port Detail Output Fields (Ethernet, Access Mode)**

| Label               | Description                                                                                                                                                                                    |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SapEgr.Unshaped-Cir | The CIR rate for the aggregate of all the unshaped 4-priority SAPs on the port                                                                                                                 |
| SapEgr.Shaper-Pol   | The access egress shaper policy ID                                                                                                                                                             |
| NetEgr.Unshaped-Cir | The CIR rate for the aggregate of all the unshaped VLANs on the port                                                                                                                           |
| NetEgr. Shaper-Pol  | The network egress shaper policy ID                                                                                                                                                            |
| Allow Eth-BN        | Indicates whether Ethernet Bandwidth Notification (ETH-BN) is allowed on the port: True or False                                                                                               |
| BN Egr.Rate in use  | The egress rate in use based on the request from the ETH-BN server MEP                                                                                                                         |
| Eth-BN hold time    | The configured hold time (in seconds) between an egress rate change based on a received Bandwidth Notification Message (BNM) and the next change request that will be accepted                 |
| Egress Rate         | The maximum amount of egress bandwidth (in kilobits per second) that this Ethernet interface can generate                                                                                      |
| Ingress Rate        | The maximum amount of ingress bandwidth (in kilobits per second) that this Ethernet interface can generate                                                                                     |
| Egr.Rate Incl.FCS   | The configured state of egress rate FCS inclusion: enabled or disabled                                                                                                                         |
| LACP Tunnel         | Indicates whether LACP packet tunneling is enabled                                                                                                                                             |
| Down-when-looped    | Enabled: The down-when-looped feature is enabled on the port                                                                                                                                   |
|                     | Disabled: The down-when-looped feature is disabled on the port                                                                                                                                 |
| Keep-alive          | The time interval between keepalive PDUs transmitted toward the network during loop detection by the down-when-looped feature                                                                  |
| Loop Detected       | Indicates whether a loop is detected on the port                                                                                                                                               |
| Retry               | The minimum wait time before the port is re-enabled after it is brought down due to a loop detection                                                                                           |
| Use Broadcast Addr  | Indicates whether the down-when-looped feature has been configured to compare the destination MAC address of received PDUs to the broadcast MAC address instead of the MAC address of the port |



**Table 67 Show Port Detail Output Fields (Ethernet, Access Mode)**

| Label              | Description                                                                                                                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Loopback           | The type of loopback configured on the port, either line, internal, or none                                                                                                                                         |
| Swap Mac Addr.     | Indicates whether MAC address swapping is enabled                                                                                                                                                                   |
| Loopback Time Left | The number of seconds left in a timed loopback<br>If there is no loopback configured or the configured loopback is latched, the value is unspecified.<br>If configured loopback is persistent, the value persistent |
| Cfm Loopback       | Indicates whether the CFM loopback is enabled                                                                                                                                                                       |
| Sync. Status Msg.  | Indicates whether Synchronization Status Messaging is enabled on the port                                                                                                                                           |
| Rx Quality Level   | The Synchronization Status Messaging quality level value received on the port                                                                                                                                       |
| Code-Type          | The Synchronization Status Messaging quality level code type, either SONET or SDH                                                                                                                                   |
| Tx Quality Level   | The Synchronization Status Messaging quality level value transmitted on the port                                                                                                                                    |
| Tx DUS/DNU         | Indicates whether the transmission of the QL-DUS/DNU value in synchronization status messages is enabled or disabled on the port                                                                                    |
| Configured Address | The base chassis Ethernet MAC address                                                                                                                                                                               |
| Hardware Address   | The interface hardware- or system-assigned MAC address at its protocol sublayer                                                                                                                                     |
| Cfg Alarm          | The type of alarms to be logged and reported for the port                                                                                                                                                           |
| Alarm Status       | The current alarm state                                                                                                                                                                                             |

**Table 67 Show Port Detail Output Fields (Ethernet, Access Mode)**

| Label                                                                         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Transceiver type                                                              | <p>The following information is provided for a configured SFP:</p> <ul style="list-style-type: none"> <li>• model number</li> <li>• TX laser wavelength</li> <li>• whether it is diagnostics capable</li> <li>• connector code</li> <li>• vendor organizationally unique identifier (OUI)</li> <li>• manufacture date</li> <li>• media</li> <li>• serial number</li> <li>• part number</li> <li>• optical compliance</li> <li>• link length support:</li> <li>• whether it is Sync-E capable</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Transceiver Digital Diagnostic Monitoring (DDM), Externally Calibrated</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                                                               | <p>SFP manufacturers specifications guidelines contained in specification SFF-8472, for the following:</p> <ul style="list-style-type: none"> <li>• temperature (C)</li> <li>• supply voltage (V)</li> <li>• Tx bias current (mA)</li> <li>• Tx output power (dBm)</li> <li>• Rx optical power (avg dBm)</li> </ul> <p>For the above categories, the following values are shown:</p> <ul style="list-style-type: none"> <li>• Value is the current measured value of each variable</li> <li>• High Alarm is the measurement of Value that will cause a DDM High Alarm to be output</li> <li>• High Warn is the measurement of Value that will cause a DDM High Warning Alarm to be output</li> <li>• Low Warn is the measurement of Value that will cause a DDM Low Warning Alarm to be output</li> <li>• Low Alarm is the measurement of Value that will cause a DDM Low Alarm to be output</li> </ul> <p>If alarms/warnings are raised, there will be an "!" in the output</p> |

**Table 67 Show Port Detail Output Fields (Ethernet, Access Mode)**

| Label                      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Traffic Statistics</b>  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Octets Input/Output        | The total number of octets received and transmitted on the port                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Packets Input/Output       | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                                                                                                         |
| Errors Input/Output        | <p>For packet-oriented interfaces, the number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol. For character-oriented or fixed-length interfaces, the number of inbound transmission units that contained errors preventing them from being deliverable to a higher-layer protocol.</p> <p>For packet-oriented interfaces, the number of outbound packets that could not be transmitted because of errors. For character-oriented or fixed-length interfaces, the number of outbound transmission units that could not be transmitted because of errors.</p> |
| <b>Ethernet Statistics</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Broadcast Pckts            | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or multicast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a unicast or multicast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                                                                                                             |
| Multicast Pckts            | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a unicast or broadcast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                                                                                                             |
| Undersize Pckts            | The total number of packets received that were shorter than 64 octets (excluding framing bits, but including FCS octets) but were otherwise well formed                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

**Table 67 Show Port Detail Output Fields (Ethernet, Access Mode)**

| Label                        | Description                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Oversize Pckts               | The total number of packets received that were longer than 1518 octets (excluding framing bits, but including FCS octets) but were otherwise well formed                                                                                                                                                                                                                        |
| Collisions                   | The best estimate of the total number of collisions on this Ethernet segment                                                                                                                                                                                                                                                                                                    |
| Drop Events                  | The total number of times that packets were detected as being dropped due to a lack of resources (not necessarily the total number of packets dropped)                                                                                                                                                                                                                          |
| CRC/Align Errors             | The total number of packets received that were between 64 and 1518 octets (excluding framing bits but including FCS octets) that had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error)                                                                                  |
| Fragments                    | The total number of packets received that were shorter than 64 octets (excluding framing bits but including FCS octets) that had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error)                                                                                      |
| Jabbers                      | The total number of packets received that were longer than 1518 octets (excluding framing bits but including FCS octets) that had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error)                                                                                     |
| Octets                       | Total number of octets received                                                                                                                                                                                                                                                                                                                                                 |
| Packets                      | Number of packets received, broken down by size                                                                                                                                                                                                                                                                                                                                 |
| <b>Port Statistics</b>       |                                                                                                                                                                                                                                                                                                                                                                                 |
| Unicast Packets Input/Output | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent. |

**Table 67 Show Port Detail Output Fields (Ethernet, Access Mode)**

| Label                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Multicast Packets Input/Output      | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a unicast or broadcast address at this sublayer, including those that were discarded or not sent                                                                                                                                                        |
| Broadcast Packets Input/Output      | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or multicast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a unicast or multicast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                       |
| Discards Input/Output               | The number of inbound/outbound packets chosen to be discarded to possibly free up buffer space                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Unknown Proto Discards Input/Output | For packet-oriented interfaces, the number of packets received via the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received via the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0. Unknown proto discards do not show up in the packet counts |
| <b>Port Discard Statistics</b>      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Inv L2 Packets Input                | The number of invalid packets that are discarded due to an unknown Layer 2 ID                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Port MTU Exceeded                   | Indicates that the port MTU has been exceeded                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Inv MPLS Labels                     | The number of MPLS labels discarded                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Inv IP Packets Input                | The number of invalid IP packets that are discarded                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| H. Policed Packets                  | The number of packets that are discarded due to hard policing                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| CSM Ingress Queues Input            | The number of incoming control packets discarded                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| CSM Egress Queues Output            | The number of outgoing control packets discarded                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

**Table 67 Show Port Detail Output Fields (Ethernet, Access Mode)**

| Label                                  | Description                                                                                                                                                                                                                                                                                              |
|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Port Control Statistics</b>         |                                                                                                                                                                                                                                                                                                          |
| Ingress Queue CTL                      | The number of forwarded packets and octets, and the number of dropped packets, for the ingress control queue. For access ports, this statistic applies only to Ethernet cards. For network ports, this statistic applies to all adapter cards.                                                           |
| Egress Queue CTL                       | The number of forwarded packets and octets, and the number of dropped packets, for the egress control queue. For access ports, this statistic applies only to Ethernet cards. For network ports, this statistic applies to all adapter cards.                                                            |
| <b>Ethernet CFM Statistics</b>         |                                                                                                                                                                                                                                                                                                          |
| Cfm LbmRx                              | The number of LBMs received                                                                                                                                                                                                                                                                              |
| Cfm LbReplyTx                          | The number of LBRs transmitted                                                                                                                                                                                                                                                                           |
| Cfm LbmDropped                         | The number of LBMs dropped                                                                                                                                                                                                                                                                               |
| Num Bn Rate Chng                       | The number of times that the port egress rate is dynamically changed based on Bandwidth Notification (BN) messages<br>Note: not every bandwidth change indicated by a BNM triggers a port egress rate change                                                                                             |
| Last BnRateChng                        | The time that the port egress rate was last changed based on a BNM                                                                                                                                                                                                                                       |
| Valid BnmRx                            | The number of valid BN messages received                                                                                                                                                                                                                                                                 |
| Last Valid BnmRx                       | The time that the last valid BNM was received                                                                                                                                                                                                                                                            |
| Invalid BnmRx                          | The number of invalid BN messages received                                                                                                                                                                                                                                                               |
| BnmOutOfRangeBW                        | The number of BN messages received with a requested bandwidth that was out of range                                                                                                                                                                                                                      |
| <b>Ethernet-like Medium Statistics</b> |                                                                                                                                                                                                                                                                                                          |
| Alignment Errors                       | The total number of packets received that had a length (excluding framing bits, but including FCS octets) of between 64 and 1518 octets, inclusive, but that had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets |

**Table 67 Show Port Detail Output Fields (Ethernet, Access Mode)**

| Label            | Description                                                                                                                   |
|------------------|-------------------------------------------------------------------------------------------------------------------------------|
| FCS Errors       | The number of frames received that are an integral number of octets in length but do not pass the FCS check                   |
| SQE Errors       | The number of times that the SQE TEST ERROR is received                                                                       |
| CSE              | The number of times that the carrier sense condition was lost or never asserted when attempting to transmit a frame           |
| Too long Frames  | The number of frames received that exceed the maximum permitted frame size                                                    |
| Symbol Errors    | For an interface operating at 100 Mb/s, the number of times there was an invalid data symbol when a valid carrier was present |
| In Pause Frames  | The number of IEEE 802.3x pause frames received for flow control; traffic is momentarily disrupted                            |
| Sngl Collisions  | The number of frames that are involved in a single collision, and are subsequently transmitted successfully                   |
| Mult Collisions  | The number of frames that are involved in more than one collision and are subsequently transmitted successfully               |
| Late Collisions  | The number of times that a collision is detected later than one slotTime into the transmission of a packet                    |
| Excess Collisns  | The number of frames for which a transmission fails due to excessive collisions                                               |
| Int MAC Tx Errs  | The number of frames for which a transmission fails due to an internal MAC sublayer transmit error                            |
| Int MAC Rx Errs  | The number of frames for which a reception fails due to an internal MAC sublayer receive error                                |
| Out Pause Frames | The number of IEEE 802.3x pause frames sent for flow control; traffic is momentarily disrupted                                |



**Note:** The 7705 SAR counts both Ethernet packets with errors and valid Ethernet packets under Ethernet port statistics. For each received errored packet, both aggregate Ethernet statistics and the errored Ethernet statistics are incremented.

### Ethernet Output Example (network mode)

The **show>port** output for an Ethernet port in network mode is similar to the access mode output (see [Ethernet Output Example \(access mode\)](#)) with the addition of a section for queue statistics. The output example below shows only the queue statistics fields.

```
*A:ALU-1># show port 1/1/1 detail
=====
Ethernet Interface
=====

.....

=====
Queue Statistics
=====

Ingress Queue 1 Packets Octets
 In Profile forwarded : 0 0
 In Profile dropped : 4626 6939000
 Out Profile forwarded : 2425 3637500
 Out Profile dropped : 0 0
Ingress Queue 2 Packets Octets
 In Profile forwarded : 2022 3033000
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
Ingress Queue 3 Packets Octets
 In Profile forwarded : 2024 3036000
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
Ingress Queue 4 Packets Octets
 In Profile forwarded : 2404 3606000
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
Ingress Queue 5 Packets Octets
 In Profile forwarded : 2396 3594000
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
Ingress Queue 6 Packets Octets
 In Profile forwarded : 2342 3513000
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
Ingress Queue 7 Packets Octets
 In Profile forwarded : 2306 3459000
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
Ingress Queue 8 Packets Octets
 In Profile forwarded : 2301 3451500
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
```



|                         |         |           |
|-------------------------|---------|-----------|
| Ingress Queue 9         | Packets | Octets    |
| In Profile forwarded :  | 0       | 0         |
| In Profile dropped :    | 0       | 0         |
| Out Profile forwarded : | 0       | 0         |
| Out Profile dropped :   | 0       | 0         |
| Ingress Queue 10        | Packets | Octets    |
| In Profile forwarded :  | 0       | 0         |
| In Profile dropped :    | 0       | 0         |
| Out Profile forwarded : | 0       | 0         |
| Out Profile dropped :   | 0       | 0         |
| Ingress Queue 11        | Packets | Octets    |
| In Profile forwarded :  | 0       | 0         |
| In Profile dropped :    | 0       | 0         |
| Out Profile forwarded : | 0       | 0         |
| Out Profile dropped :   | 0       | 0         |
| Ingress Queue 12        | Packets | Octets    |
| In Profile forwarded :  | 0       | 0         |
| In Profile dropped :    | 0       | 0         |
| Out Profile forwarded : | 0       | 0         |
| Out Profile dropped :   | 0       | 0         |
| Ingress Queue 13        | Packets | Octets    |
| In Profile forwarded :  | 0       | 0         |
| In Profile dropped :    | 0       | 0         |
| Out Profile forwarded : | 0       | 0         |
| Out Profile dropped :   | 0       | 0         |
| Ingress Queue 14        | Packets | Octets    |
| In Profile forwarded :  | 0       | 0         |
| In Profile dropped :    | 0       | 0         |
| Out Profile forwarded : | 0       | 0         |
| Out Profile dropped :   | 0       | 0         |
| Ingress Queue 15        | Packets | Octets    |
| In Profile forwarded :  | 0       | 0         |
| In Profile dropped :    | 0       | 0         |
| Out Profile forwarded : | 0       | 0         |
| Out Profile dropped :   | 0       | 0         |
| Ingress Queue 16        | Packets | Octets    |
| In Profile forwarded :  | 0       | 0         |
| In Profile dropped :    | 0       | 0         |
| Out Profile forwarded : | 0       | 0         |
| Out Profile dropped :   | 0       | 0         |
| Ingress Queue CTL       | Packets | Octets    |
| Forwarded :             | 0       | 0         |
| Dropped :               | 0       | N/A       |
| Unshaped Egress Queue 1 | Packets | Octets    |
| In Profile forwarded :  | 0       | 0         |
| In Profile dropped :    | 0       | 0         |
| Out Profile forwarded : | 129084  | 193109664 |
| Out Profile dropped :   | 0       | 0         |
| Unshaped Egress Queue 2 | Packets | Octets    |
| In Profile forwarded :  | 128674  | 192496304 |
| In Profile dropped :    | 0       | 0         |
| Out Profile forwarded : | 0       | 0         |
| Out Profile dropped :   | 0       | 0         |
| Unshaped Egress Queue 3 | Packets | Octets    |
| In Profile forwarded :  | 128685  | 192512760 |
| In Profile dropped :    | 0       | 0         |
| Out Profile forwarded : | 0       | 0         |
| Out Profile dropped :   | 0       | 0         |

```

Unshaped Egress Queue 4 Packets Octets
 In Profile forwarded : 154389 230965944
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
Unshaped Egress Queue 5 Packets Octets
 In Profile forwarded : 154372 230940512
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
Unshaped Egress Queue 6 Packets Octets
 In Profile forwarded : 154306 230841776
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
Unshaped Egress Queue 7 Packets Octets
 In Profile forwarded : 154265 230780440
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
Unshaped Egress Queue 8 Packets Octets
 In Profile forwarded : 154261 230774456
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0

Total Egress from all Shaped and Unshaped Queues
 Packets Octets
 In Profile forwarded : 1028952 1539312192
 In Profile dropped : 0 0
 Out Profile forwarded : 129084 193109664
 Out Profile dropped : 0 0

Egress Queue CTL Packets Octets
 Forwarded : 16 1024
 Dropped : 0 N/A
=====

```

See [Table 67](#) for field descriptions common to both access and network mode outputs.

**Table 68 Show Port Detail Output Fields (Ethernet, Network Mode)**

| Label                   | Description                                                                                                                                                                                           |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Queue Statistics</b> |                                                                                                                                                                                                       |
| Ingress Queue           | For the specified ingress queue, the number of packets and octets that are: <ul style="list-style-type: none"> <li>• In Profile forwarded/dropped</li> <li>• Out Profile forwarded/dropped</li> </ul> |

**Table 68**      **Show Port Detail Output Fields (Ethernet, Network Mode)**

| Label                                            | Description                                                                                                                                                                                                           |
|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Unshaped Egress Queue                            | For the specified unshaped egress queue, the of number packets and octets that are: <ul style="list-style-type: none"> <li>• In Profile forwarded/dropped</li> <li>• Out Profile forwarded/dropped</li> </ul>         |
| Total Egress from all Shaped and Unshaped Queues | For all shaped and unshaped queues, the total number of egress packets and octets that are: <ul style="list-style-type: none"> <li>• In Profile forwarded/dropped</li> <li>• Out Profile forwarded/dropped</li> </ul> |
| Egress Queue CTL                                 | The number of forwarded packets and octets, and the number of dropped packets, for the egress control queue.                                                                                                          |

### DSL Output Example

```
*A:ALU-1># show port 1/3/2 detail
=====
DSL Interface
=====
Description : XDSL Bonding
Interface : 1/3/2
PortType : XDSL
Admin State : up
Oper State : up
NtrDslLineID : 1
NtrLockedStatus : lock
NtrStdDev : 100
NtrMinError : 10 ns
NtrErrHsty (*28 ns) : 00 ff 00 00 00 00 00 00 00 00 00 00 00 00 00 00
 : 00 00 00 00 00 00 00 00 00 00 00 00 00 01 00 00 00
 : 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ff 00
 : 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ff 00
 : 00 00 00 00 00 00 00 00 00 00 01 00 00 01 00 00 00
 : 00 00 00 00 00 00 00 00 00 00 00 00 00 ff 00 00
 : 00 00 00 00 00 00 01 00 00 00 00 00 00 00 00 01
 : 00 00 00 00 00 00 00 00 00 00 00 ff 00 00 00 00
 : 00 00 00 00 00 00 00 00 00 00 ff 00 00 00 01 00
 : 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
 : 00 00 00 ff 00 00 00 00 00 00 00 00 00 00 00 00
 : 00 00 01 00 00 00 00 00 ff 00 00 00 00 00 00 00
 : 00 00 00 00 00 00 00 00 01 00 00 00 00 ff 00 00 ff
 : 00 00 00 ff 00 00 00 00 00 00 00 00 00 00 00 00 ff
 : 00 00 00 00 00 00 00 00 01 00 00 00 01 00 00 00
 : 00 00 00 00 00 00 00 00 00 00 00 ff 00 00 00 ff

IfIndex : 39911424
Last State Change : 06/02/2011 18:54:33
Last Cleared Time : N/A

Configured Mode : access
Dot1Q Ethertype : 0x8100
Ing. Pool % Rate : 100

MTU : 1518
Hold time up : 0 seconds
Hold time down : 0 seconds

Encap Type : 802.1q
Egr. Pool % Rate : 100
```

```

Net. Egr. Queue Pol: default
Egress Rate : Default
Down-when-looped : Disabled
Loop Detected : False
Use Broadcast Addr : False

Ingress Rate : n/a
Keep-alive : 10
Retry : 120

Loopback : none
Loopback Time Left : unspecified
Cfm Loopback : Disabled

Sync. Status Msg. : Disabled
Rx Quality Level : N/A

Configured Address : 38:52:1a:e4:53:7b
Hardware Address : 38:52:1a:e4:53:7b

```

**Table 69 Show Port Detail Output Fields (DSL)**

| Label                | Description                                                         |
|----------------------|---------------------------------------------------------------------|
| <b>DSL Interface</b> |                                                                     |
| Description          | A text description of the port                                      |
| Interface            | The port ID displayed in the <i>slot/mda/port</i> format            |
| US Rate              | The trained rate of the DSL port in the upstream direction          |
| DS Rate              | The trained rate of the DSL port in the downstream direction        |
| PortType             | The type of DSL port installed                                      |
| Admin State          | up: the port is administratively up                                 |
|                      | down: the port is administratively down                             |
| Oper State           | up: the port is operationally up                                    |
|                      | down: the port is operationally down                                |
| BondingType          | The DSL bonding type                                                |
| BondingState         | up: DSL bonding is operationally up                                 |
|                      | down: DSL bonding is operationally down                             |
| NtrDslLineID         | The DSL line number that derives NTR                                |
| AtmVpi               | The ATM VPI used for traffic when DSL lines are trained in ATM mode |
| NtrLockedStatus      | The NTR lock status of the DSL line                                 |
| AtmVci               | The ATM VCI used for traffic when DSL lines are trained in ATM mode |

**Table 69 Show Port Detail Output Fields (DSL) (Continued)**

| Label               | Description                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NtrStdDev           | The standard deviation of NTR clock errors over a 10-second period of the phase error between the encoded phase information (as present in the NTR field of the overhead frame) and the CPE regenerated NTR clock                                                                                                                                                                                                                      |
| NtrMaxError         | The maximum NTR phase error (after a lock has been declared), between the encoded phase information in the NTR field of the overhead frame and the CPE regenerated NTR clock                                                                                                                                                                                                                                                           |
| NtrMinError         | The minimum NTR phase error (after a lock has been declared), between the encoded phase information in the NTR field of the overhead frame and the CPE regenerated NTR clock                                                                                                                                                                                                                                                           |
| NtrSampleClkPeri*   | The sample clock period for NTR in nanoseconds<br>This number, multiplied by the NtrErrHsty value, results in the phase error in nanoseconds between the encoded phase information in the NTR field of the overhead frame and the CPE regenerated NTR clock                                                                                                                                                                            |
| NtrErrHsty (*28 ns) | An array of bytes indicating the NTR phase error history<br>Each byte represents the phase error between the encoded phase information in the NTR field of the overhead frame and the CPE regenerated NTR clock. The phase error values are expressed in clock ticks based on the NtrSampleClkPer* and are displayed as a signed integer in hexadecimal notation.<br>The time interval between bytes is 1/16 <sup>th</sup> of a second |
| IfIndex             | The interface's index number, which reflects its initialization sequence                                                                                                                                                                                                                                                                                                                                                               |
| MTU                 | The configured MTU                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Last State Change   | The last time that the operational status of the port changed state                                                                                                                                                                                                                                                                                                                                                                    |
| Hold time up        | The link-up dampening time in seconds                                                                                                                                                                                                                                                                                                                                                                                                  |
| Last Cleared Time   | The time since the last clear                                                                                                                                                                                                                                                                                                                                                                                                          |
| Hold time down      | The link-down dampening time in seconds                                                                                                                                                                                                                                                                                                                                                                                                |
| Configured Mode     | The configured port mode, either access or network                                                                                                                                                                                                                                                                                                                                                                                     |

**Table 69 Show Port Detail Output Fields (DSL) (Continued)**

| Label              | Description                                                                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Encap Type         | null: ingress frames will not use any tags or labels to delineate a service                                                                                                                    |
|                    | dot1q: ingress frames carry 802.1Q tags, where each tag signifies a different service                                                                                                          |
| Dot1Q Ethertype    | The protocol carried in a dot1q Ethernet frame                                                                                                                                                 |
| Ing. Pool % Rate   | The amount of ingress buffer space, expressed as a percentage of the available buffer space, that will be allocated to the port for ingress buffering                                          |
| Egr. Pool % Rate   | The amount of egress buffer space, expressed as a percentage of the available buffer space, that will be allocated to the port for egress buffering                                            |
| Net Egr. Queue Pol | The number of the associated network egress queue QoS policy, or default if the default policy is used                                                                                         |
| Egress Rate        | The maximum amount of egress bandwidth (in kilobits per second) that this interface can generate                                                                                               |
| Down-when-looped   | Enabled: The down-when-looped feature is enabled on the port                                                                                                                                   |
|                    | Disabled: The down-when-looped feature is disabled on the port                                                                                                                                 |
| Keep-alive         | The time interval between keepalive PDUs transmitted toward the network during loop detection by the down-when-looped feature                                                                  |
| Loop Detected      | Indicates whether a loop is detected on the port                                                                                                                                               |
| Retry              | The minimum wait time before the port is re-enabled after it is brought down due to a loop detection                                                                                           |
| Use Broadcast Addr | Indicates whether the down-when-looped feature has been configured to compare the destination MAC address of received PDUs to the broadcast MAC address instead of the MAC address of the port |
| Loopback           | The type of loopback configured on the port, either internal or none                                                                                                                           |
| Loopback Time Left | The number of seconds left in a timed loopback; if there is no loopback configured or the configured loopback is latched, the value is unspecified                                             |
| Cfm Loopback       | Indicates whether the CFM loopback is enabled                                                                                                                                                  |

**Table 69 Show Port Detail Output Fields (DSL) (Continued)**

| Label              | Description                                                                     |
|--------------------|---------------------------------------------------------------------------------|
| Sync. Status Msg.  | Indicates whether Synchronization Status Messaging is enabled on the port       |
| Rx Quality Level   | The Synchronization Status Messaging quality level value received on the port   |
| Configured Address | The base chassis Ethernet MAC address                                           |
| Hardware Address   | The interface hardware- or system-assigned MAC address at its protocol sublayer |

**GPON Output Example**

```

*A:ALU-1 show port 1/3/1 detail
=====
GPON Interface
=====
Description : GPON
Interface : 1/3/1 ONT Enet Speed : 1 gbps
Admin State : up ONT Enet Status : active
Oper State : up
ONT Active SW Ver : 3FE52259AHCA10 PON Status : active
G984 Serial Number : ALCLF7A00035
IfIndex : 39878656 MTU : 1514
Last State Change : 03/07/2011 18:23:47
Last Cleared Time : 03/07/2011 18:22:53

Configured Mode : network Encap Type : null
Dot1Q Ethertype : 0x8100
Ing. Pool % Rate : 100 Egr. Pool % Rate : 100
Net. Egr. Queue Pol : default Ingress Rate : n/a
Egress Rate : Default

Down-when-looped : Disabled Keep-alive : 10
Loop Detected : False Retry : 120
Use Broadcast Addr : False

Loopback : none
Loopback Time Left : unspecified
Cfm Loopback : low

SLID : 44:45:46:41:55:4C:54:00:00:00
Configured Address : 7c:20:64:ec:be:f8
Hardware Address : 7c:20:64:ec:be:f8
=====
Traffic Statistics
=====
 Input Output

Octets 0 0
Packets 0 0
Errors 0 0
=====

```

```

Ethernet Statistics
=====
Broadcast Pkts : 166567 Drop Events : 0
Multicast Pkts : 0 CRC/Align Errors : 0
Undersize Pkts : 0 Fragments : 0
Oversize Pkts : 0 Jabbers : 0
Collisions : 0

Octets : 17156362
Packets : 166567
Packets of 64 Octets : 83284
Packets of 65 to 127 Octets : 0
Packets of 128 to 255 Octets : 83283
Packets of 256 to 511 Octets : 0
Packets of 512 to 1023 Octets : 0
Packets of 1024 to 1518 Octets : 0
Packets of 1519 or more Octets : 0

=====
GPON ONT Current Interval Statistics
=====

Last Updated: 03/08/2011 17:31:54
warning: Some ONT statistics are disabled

Ethernet :
Tx Frames : 0 Rx Frames : 0
Tx Bytes : 0 Rx Bytes : 0
Drop Frames Up : 0 Drop Frames Down : 0
Tx Mcast Frames : 0 Rx Mcast Frames : 0
FCS Errors : 0 Exc Collisions : 0
Late Collisions : 0 Too Long Frames : 0
Rx Buf Overflow : 0 Tx Buf Overflow : 0
Sngl Collisions : 0 Mult Collisions : 0
SQE Test Errors : 0 Deferred Tx : 0
Int MAC Tx Errs : 0 CSE Count : 0
Alignment Errors : 0 Int MAC Rx Errs : 0

Aggregate GEM :
Lost Frags Down : 0 Lost Frags Up : 0
Receive Frags : 0 Receive Blocks : 0
Transmit Blocks : 0 Transmit Frags : 0
Bad Headers : 0

=====
GPON ONT Previous Interval Statistics
=====

Last Updated: 03/08/2011 17:31:54
warning: Some ONT statistics are disabled

Ethernet :
Tx Frames : 0 Rx Frames : 0
Tx Bytes : 0 Rx Bytes : 0
Drop Frames Up : 0 Drop Frames Down : 0
Tx Mcast Frames : 0 Rx Mcast Frames : 0
FCS Errors : 0 Exc Collisions : 0
Late Collisions : 0 Too Long Frames : 0
Rx Buf Overflow : 0 Tx Buf Overflow : 0

```



```

Sngl Collisions : 0 Mult Collisions : 0
SQE Test Errors : 0 Deferred Tx : 0
Int MAC Tx Errs : 0 CSE Count : 0
Alignment Errors : 0 Int MAC Rx Errs : 0

```

```

Aggregate GEM :
Lost Frags Down : 0 Lost Frags Up : 0
Receive Frags : 0 Receive Blocks : 0
Transmit Blocks : 0 Transmit Frags : 0
Bad Headers : 0

```

#### Port Statistics

```

=====
Input Output

Unicast Packets 166610 0
Multicast Packets 0 0
Broadcast Packets 83305 83306
Discards 0 0
Unknown Proto Discards 0
=====

```

#### Port Discard Statistics

```

=====
Input Output

Inv L2 Packets : 0 Port MTU Exceeded: 0
Inv MPLS Labels : 0
Inv IP Packets : 0
CSM Ingress Queues CSM Egress Queues
 Hi : 0 Common : 0
 Medium : 0
 Low : 0
=====

```

#### Ethernet-like Medium Statistics

```

=====
Alignment Errors : 0 Sngl Collisions : 0
FCS Errors : 0 Mult Collisions : 0
SQE Test Errors : 0 Late Collisions : 0
CSE : 0 Excess Collisns : 0
Too long Frames : 0 Int MAC Tx Errs : 0
Symbol Errors : 0 Int MAC Rx Errs : 0
=====

```

#### Ethernet CFM Loopback Statistics

```

=====
Cfm LbmRx : 0
Cfm LbReplyTx : 0 Cfm LbmDropped : 0
=====

```

## Queue Statistics

```

=====

Ingress Queue 1 Packets Octets
 In Profile forwarded : 0 0
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
Ingress Queue 2 Packets Octets
 In Profile forwarded : 0 0
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
Ingress Queue 3 Packets Octets
 In Profile forwarded : 0 0
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
Ingress Queue 4 Packets Octets
 In Profile forwarded : 0 0
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
Ingress Queue 5 Packets Octets
 In Profile forwarded : 0 0
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
Ingress Queue 6 Packets Octets
 In Profile forwarded : 0 0
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
Ingress Queue 7 Packets Octets
 In Profile forwarded : 0 0
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
Ingress Queue 8 Packets Octets
 In Profile forwarded : 0 0
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
Ingress Queue 9 Packets Octets
 In Profile forwarded : 0 0
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
Ingress Queue 10 Packets Octets
 In Profile forwarded : 0 0
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
Ingress Queue 11 Packets Octets
 In Profile forwarded : 0 0
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0

```

|                         |         |        |
|-------------------------|---------|--------|
| Ingress Queue 12        | Packets | Octets |
| In Profile forwarded :  | 0       | 0      |
| In Profile dropped :    | 0       | 0      |
| Out Profile forwarded : | 0       | 0      |
| Out Profile dropped :   | 0       | 0      |
| Ingress Queue 13        | Packets | Octets |
| In Profile forwarded :  | 0       | 0      |
| In Profile dropped :    | 0       | 0      |
| Out Profile forwarded : | 0       | 0      |
| Out Profile dropped :   | 0       | 0      |
| Ingress Queue 14        | Packets | Octets |
| In Profile forwarded :  | 0       | 0      |
| In Profile dropped :    | 0       | 0      |
| Out Profile forwarded : | 0       | 0      |
| Out Profile dropped :   | 0       | 0      |
| Ingress Queue 15        | Packets | Octets |
| In Profile forwarded :  | 0       | 0      |
| In Profile dropped :    | 0       | 0      |
| Out Profile forwarded : | 0       | 0      |
| Out Profile dropped :   | 0       | 0      |
| Ingress Queue 16        | Packets | Octets |
| In Profile forwarded :  | 0       | 0      |
| In Profile dropped :    | 0       | 0      |
| Out Profile forwarded : | 0       | 0      |
| Out Profile dropped :   | 0       | 0      |
| Ingress Queue CTL       | Packets | Octets |
| Forwarded :             | 0       | 0      |
| Dropped :               | 0       | N/A    |
| Egress Queue 1          | Packets | Octets |
| In Profile forwarded :  | 0       | 0      |
| In Profile dropped :    | 0       | 0      |
| Out Profile forwarded : | 0       | 0      |
| Out Profile dropped :   | 0       | 0      |
| Egress Queue 2          | Packets | Octets |
| In Profile forwarded :  | 0       | 0      |
| In Profile dropped :    | 0       | 0      |
| Out Profile forwarded : | 0       | 0      |
| Out Profile dropped :   | 0       | 0      |
| Egress Queue 3          | Packets | Octets |
| In Profile forwarded :  | 0       | 0      |
| In Profile dropped :    | 0       | 0      |
| Out Profile forwarded : | 0       | 0      |
| Out Profile dropped :   | 0       | 0      |
| Egress Queue 4          | Packets | Octets |
| In Profile forwarded :  | 0       | 0      |
| In Profile dropped :    | 0       | 0      |
| Out Profile forwarded : | 0       | 0      |
| Out Profile dropped :   | 0       | 0      |
| Egress Queue 5          | Packets | Octets |
| In Profile forwarded :  | 0       | 0      |
| In Profile dropped :    | 0       | 0      |
| Out Profile forwarded : | 0       | 0      |
| Out Profile dropped :   | 0       | 0      |
| Egress Queue 6          | Packets | Octets |
| In Profile forwarded :  | 0       | 0      |
| In Profile dropped :    | 0       | 0      |
| Out Profile forwarded : | 0       | 0      |
| Out Profile dropped :   | 0       | 0      |

```

Egress Queue 7 Packets Octets
 In Profile forwarded : 0 0
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
Egress Queue 8 Packets Octets
 In Profile forwarded : 0 0
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
Egress Queue CTL Packets Octets
 Forwarded : 0 0
 Dropped : 0 N/A
=====

```

**Table 70 Show Port Detail Output Fields (GPON)**

| Label                 | Description                                                              |
|-----------------------|--------------------------------------------------------------------------|
| <b>GPON Interface</b> |                                                                          |
| Description           | A text description of the port                                           |
| Interface             | The port ID displayed in the <i>slot/mda/port</i> format                 |
| Admin State           | up: the port is administratively up                                      |
|                       | down: the port is administratively down                                  |
| Oper State            | up: the port is operationally up                                         |
|                       | down: the port is operationally down                                     |
| ONT Active SW Ver     | The GPON module software version                                         |
| G984 Serial Number    | The G984 serial number that is used for provisioning with the OLT        |
| IfIndex               | The interface's index number, which reflects its initialization sequence |
| Last State Change     | The last time that the operational status of the port changed state      |
| Last Cleared Time     | The time since the last clear                                            |
| ONT Enet Speed        | The Ethernet speed of the GPON module                                    |
| ONT Enet Status       | The Ethernet status of the GPON module                                   |
| PON Status            | The status of the PON                                                    |
| MTU                   | The configured MTU                                                       |
| Configured Mode       | The configured port mode, either access or network                       |

**Table 70 Show Port Detail Output Fields (GPON) (Continued)**

| Label               | Description                                                                                                                                                                                    |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Encap Type          | null: ingress frames will not use any tags or labels to delineate a service                                                                                                                    |
|                     | dot1q: ingress frames carry 802.1Q tags, where each tag signifies a different service                                                                                                          |
| Dot1Q Ethertype     | The protocol carried in a dot1q Ethernet frame                                                                                                                                                 |
| Ing. Pool % Rate    | The amount of ingress buffer space, expressed as a percentage of the available buffer space, that will be allocated to the port for ingress buffering                                          |
| Net. Egr. Queue Pol | The number of the associated network egress queue QoS policy, or default if the default policy is used                                                                                         |
| Net Scheduler Mode  | The mode for servicing CoS queues; 16-priority scheduling is the only supported value                                                                                                          |
| Egress Rate         | The maximum amount of egress bandwidth (in kilobits per second) that this interface can generate                                                                                               |
| Down-when-looped    | Enabled: The down-when-looped feature is enabled on the port                                                                                                                                   |
|                     | Disabled: The down-when-looped feature is disabled on the port                                                                                                                                 |
| Keep-alive          | The time interval between keepalive PDUs transmitted toward the network during loop detection by the down-when-looped feature                                                                  |
| Loop Detected       | Indicates whether a loop is detected on the port                                                                                                                                               |
| Retry               | The minimum wait time before the port is re-enabled after it is brought down due to a loop detection                                                                                           |
| Use Broadcast Addr  | Indicates whether the down-when-looped feature has been configured to compare the destination MAC address of received PDUs to the broadcast MAC address instead of the MAC address of the port |
| Egr. Pool % Rate    | The amount of egress buffer space, expressed as a percentage of the available buffer space, that will be allocated to the port for egress buffering                                            |
| Loopback            | The type of loopback configured on the port, either line, internal, or none                                                                                                                    |

**Table 70 Show Port Detail Output Fields (GPON) (Continued)**

| Label                                                                                                                                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Loopback Time Left                                                                                                                   | The number of seconds left in a timed loopback. If there is no loopback configured or the configured loopback is latched, the value is unspecified.                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Cfm Loopback                                                                                                                         | Indicates whether the CFM loopback is enabled.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Configured Address                                                                                                                   | The base chassis Ethernet MAC address.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Hardware Address                                                                                                                     | The interface hardware- or system-assigned MAC address at its protocol sublayer.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Traffic Statistics</b> (These statistics are generated at the Ethernet port on the 7705 SAR-M backplane facing the GPON module.)  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Octets Input/Output                                                                                                                  | The total number of octets received and transmitted on the port.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Packets Input/Output                                                                                                                 | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                                                                                                         |
| Errors Input/Output                                                                                                                  | <p>For packet-oriented interfaces, the number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol. For character-oriented or fixed-length interfaces, the number of inbound transmission units that contained errors preventing them from being deliverable to a higher-layer protocol.</p> <p>For packet-oriented interfaces, the number of outbound packets that could not be transmitted because of errors. For character-oriented or fixed-length interfaces, the number of outbound transmission units that could not be transmitted because of errors.</p> |
| <b>Ethernet Statistics</b> (These statistics are generated at the Ethernet port on the 7705 SAR-M backplane facing the GPON module.) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Broadcast Pckts                                                                                                                      | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or multicast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a unicast or multicast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                                                                                                             |

**Table 70 Show Port Detail Output Fields (GPON) (Continued)**

| Label                                       | Description                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Multicast Pckts                             | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a unicast or broadcast address at this sublayer, including those that were discarded or not sent. |
| Undersize Pckts                             | The total number of packets received that were shorter than 64 octets (excluding framing bits, but including FCS octets) but were otherwise well formed                                                                                                                                                                                                                     |
| Oversize Pckts                              | The total number of packets received that were longer than 1518 octets (excluding framing bits, but including FCS octets) but were otherwise well formed                                                                                                                                                                                                                    |
| Collisions                                  | The best estimate of the total number of collisions on this Ethernet segment                                                                                                                                                                                                                                                                                                |
| Drop Events                                 | The total number of times that packets were detected as being dropped due to a lack of resources (not necessarily the total number of packets dropped)                                                                                                                                                                                                                      |
| CRC/Align Errors                            | The total number of packets received that were between 64 and 1518 octets (excluding framing bits but including FCS octets) that had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error)                                                                              |
| Fragments                                   | The total number of packets received that were shorter than 64 octets (excluding framing bits but including FCS octets) that had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error)                                                                                  |
| Jabbers                                     | The total number of packets received that were longer than 1518 octets (excluding framing bits but including FCS octets) that had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error)                                                                                 |
| Octets                                      | Total number of octets received                                                                                                                                                                                                                                                                                                                                             |
| Packets                                     | Number of packets received, broken down by size                                                                                                                                                                                                                                                                                                                             |
| <b>GPON ONT Current Interval Statistics</b> |                                                                                                                                                                                                                                                                                                                                                                             |

**Table 70 Show Port Detail Output Fields (GPON) (Continued)**

| Label                                                                                                                     | Description                                          |
|---------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|
| <b>Ethernet</b> (These statistics are generated at the Ethernet port on the GPON module facing the 7705 SAR-M backplane.) |                                                      |
| Tx Frames                                                                                                                 | Total number of frames transmitted                   |
| Tx Bytes                                                                                                                  | Total number of bytes transmitted                    |
| Drop Frames Up                                                                                                            | Total number of transmitted frames that were dropped |
| Tx Mcast Frames                                                                                                           | Total number of multicast frames transmitted         |
| FCS Errors                                                                                                                | Total number of FCS errors                           |
| Late Collisions                                                                                                           | Total number of late collisions                      |
| Rx Buf Overflow                                                                                                           | Total number of buffer overflows on receive          |
| Sngl Collisions                                                                                                           | Total number of single collisions                    |
| SQE Test Errors                                                                                                           | Total number of SQE test errors                      |
| Int MAC Tx Errs                                                                                                           | Total number of internal MAC transmit errors         |
| Alignment Errors                                                                                                          | Total number of alignment errors                     |
| Rx Frames                                                                                                                 | Total number of frames received                      |
| Rx Bytes                                                                                                                  | Total number of bytes received                       |
| Drop Frames Down                                                                                                          | Total number of frames that were dropped downstream  |
| Rx Mcast Frames                                                                                                           | Total number of multicast frames received            |
| Exc Collisions                                                                                                            | Total number of excessive collisions                 |
| Too Long Frames                                                                                                           | Total number of frames that are too long             |
| Tx Buf Overflow                                                                                                           | Total number of buffer overflows on transmission     |
| Mult Collisions                                                                                                           | Total number of multiple collisions                  |
| Deferred Tx                                                                                                               | Total number of deferred transmissions               |
| CSE Count                                                                                                                 | Total number of carrier sense errors                 |
| Int Mac Rx Errs                                                                                                           | Total number of internal MAC receive errors          |
| <b>Aggregate GEM</b> (These statistics are generated at the GPON module facing the OLT/ISAM0)                             |                                                      |
| Lost Frags Down                                                                                                           | Aggregate number of lost GEM fragments transmitted   |
| Receive Frags                                                                                                             | Aggregate number of GEM fragments received           |



**Table 70 Show Port Detail Output Fields (GPON) (Continued)**

| Label                                                                                                                     | Description                                          |
|---------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|
| Transmit Blocks                                                                                                           | Aggregate number of GEM blocks transmitted           |
| Bad Headers                                                                                                               | Aggregate number of bad GEM headers received         |
| Lost Frags Up                                                                                                             | Aggregate number of lost GEM fragments received      |
| Receive Blocks                                                                                                            | Aggregate number of GEM blocks received              |
| Transmit Frags                                                                                                            | Aggregate number of transmitted GEM fragments        |
| <b>GPON ONT Previous Interval Statistics</b>                                                                              |                                                      |
| <b>Ethernet</b> (These statistics are generated at the Ethernet port on the GPON module facing the 7705 SAR-M backplane.) |                                                      |
| Tx Frames                                                                                                                 | Total number of frames transmitted                   |
| Tx Bytes                                                                                                                  | Total number of bytes transmitted                    |
| Drop Frames Up                                                                                                            | Total number of transmitted frames that were dropped |
| Tx Mcast Frames                                                                                                           | Total number of multicast frames transmitted         |
| FCS Errors                                                                                                                | Total number of FCS errors                           |
| Late Collisions                                                                                                           | Total number of late collisions                      |
| Rx Buf Overflow                                                                                                           | Total number of buffer overflows on receive          |
| Mult Collisions                                                                                                           | Total number of single collision                     |
| Deferred Tx                                                                                                               | Total number of deferred transmissions               |
| CSE Count                                                                                                                 | Total number of carrier sense errors                 |
| Int Mac Rx Err                                                                                                            | Total number of internal MAC receive errors          |
| <b>Aggregate GEM</b> (These statistics are generated at the GPON module facing the OLT/ISAM)                              |                                                      |
| Lost Frags Down                                                                                                           | Aggregate number of lost GEM fragments transmitted   |
| Receive Frags                                                                                                             | Aggregate number of GEM fragments received           |
| Transmit Blocks                                                                                                           | Aggregate number of GEM blocks transmitted           |
| Bad Headers                                                                                                               | Aggregate number of bad GEM headers received         |
| Lost Frags Up                                                                                                             | Aggregate number of lost GEM fragments received      |
| Receive Block                                                                                                             | Aggregate number of GEM blocks received              |
| Transmit Frags                                                                                                            | Aggregate number of transmitted GEM fragments        |

**Table 70 Show Port Detail Output Fields (GPON) (Continued)**

| Label                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Port Statistics</b>              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Unicast Packets Input/Output        | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                   |
| Multicast Packets Input/Output      | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a unicast or broadcast address at this sublayer, including those that were discarded or not sent                                                                                                                                                        |
| Broadcast Packets Input/Output      | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or multicast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a unicast or multicast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                       |
| Discards Input/Output               | The number of inbound/outbound packets chosen to be discarded to possibly free up buffer space                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Unknown Proto Discards Input/Output | For packet-oriented interfaces, the number of packets received via the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received via the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0. Unknown proto discards do not show up in the packet counts |
| <b>Port Discard Statistics</b>      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Inv L2 Packets Input                | The number of invalid packets that are discarded due to an unknown Layer 2 ID                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Port MTU Exceeded                   | Indicates that the port MTU has been exceeded                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Inv MPLS Labels                     | The number of MPLS labels discarded                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

**Table 70 Show Port Detail Output Fields (GPON) (Continued)**

| Label                                  | Description                                                                                                                                                                                                                                                                                              |
|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Inv IP Packets Input                   | The number of invalid IP packets that are discarded                                                                                                                                                                                                                                                      |
| H. Policed Packets                     | The number of packets that are discarded due to hard policing                                                                                                                                                                                                                                            |
| CSM Ingress Queues                     | The number of incoming control packets discarded                                                                                                                                                                                                                                                         |
| CSM Egress Queues Common               | The number of outgoing control packets discarded                                                                                                                                                                                                                                                         |
| <b>Ethernet-like Medium Statistics</b> |                                                                                                                                                                                                                                                                                                          |
| Alignment Errors                       | The total number of packets received that had a length (excluding framing bits, but including FCS octets) of between 64 and 1518 octets, inclusive, but that had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets |
| FCS Errors                             | The number of frames received that are an integral number of octets in length but do not pass the FCS check                                                                                                                                                                                              |
| SQE Errors                             | The number of times that the SQE TEST ERROR is received                                                                                                                                                                                                                                                  |
| CSE                                    | The number of times that the carrier sense condition was lost or never asserted when attempting to transmit a frame                                                                                                                                                                                      |
| Too long Frames                        | The number of frames received that exceed the maximum permitted frame size                                                                                                                                                                                                                               |
| Symbol Errors                          | For an interface operating at 100 Mb/s, the number of times there was an invalid data symbol when a valid carrier was present                                                                                                                                                                            |
| Sngl Collisions                        | The number of frames that are involved in a single collision, and are subsequently transmitted successfully                                                                                                                                                                                              |
| Mult Collisions                        | The number of frames that are involved in more than one collision and are subsequently transmitted successfully                                                                                                                                                                                          |
| Late Collisions                        | The number of times that a collision is detected later than one slotTime into the transmission of a packet                                                                                                                                                                                               |
| Excess Collisions                      | The number of frames for which a transmission fails due to excessive collisions                                                                                                                                                                                                                          |
| Int MAC Tx Errs                        | The number of frames for which a transmission fails due to an internal MAC sublayer transmit error                                                                                                                                                                                                       |

**Table 70 Show Port Detail Output Fields (GPON) (Continued)**

| Label                                   | Description                                                                                    |
|-----------------------------------------|------------------------------------------------------------------------------------------------|
| Int MAC Rx Errs                         | The number of frames for which a reception fails due to an internal MAC sublayer receive error |
| <b>Ethernet CFM Loopback Statistics</b> |                                                                                                |
| Cfm LbmRx                               | The number of LBMs received                                                                    |
| Cfm LbReplyTx                           | The number of LBMs transmitted                                                                 |
| Cfm LbmDropped                          | The number of LBMs dropped                                                                     |
| <b>Queue Statistics</b>                 |                                                                                                |
| Ingress Queue                           | In Profile forwarded/dropped                                                                   |
|                                         | Out Profile forwarded/dropped                                                                  |
| Egress Queue                            | In Profile forwarded/dropped                                                                   |
|                                         | Out Profile forwarded/dropped                                                                  |

**Output Example**

```
sar18# show port 1/11/1 detail
=====
Ethernet Interface
=====
Description : 10-Gig Bridged Ethernet
Interface : 1/11/1
Link-level : Ethernet
Admin State : up
Oper State : up
Physical Link : Yes
Single Fiber Mode : No
IfIndex : 39878656
Last State Change : 11/03/2012 21:30:51
Last Cleared Time : N/A
Oper Speed : 10 Gbps
Config Speed : N/A
Oper Duplex : full
Config Duplex : N/A
MTU : 9728
Hold time up : 0 seconds
Hold time down : 0 seconds
DDM Events : Enabled

Configured Mode : network
Dot1Q Ethertype : 0x8100
Ing. Pool % Rate : 100
Net. Egr. Queue Pol: default
Net. Scheduler Mode: 16-priority
Auto-negotiate : N/A
Config Phy-tx-clock: not-applicable
Egress Rate : Default
Ingress CBS(bytes) : 130816
Encap Type : Null&dot1q
VLAN Filter : 2
Egr. Pool % Rate : 100
MDI/MDX : N/A
Oper Phy-tx-clock: N/A
Ingress Rate : Default
Src-pause : N/A
LACP Tunnel : N/A

Down-when-looped : N/A
Loop Detected : N/A
Use Broadcast Addr : N/A
Keep-alive : N/A
Retry : N/A
```

```

Loopback : none Swap Mac Addr : Disabled
Loopback Time Left : unspecified
Cfm Loopback : dot1p
Cfm Loopback Vlan : 10-15,20,47

Sync. Status Msg. : Disabled Rx Quality Level : N/A

PTP Asymmetry : N/A Edge Timestamp : Disable
Timestamp Capable : False

Configured Address :
Hardware Address :
Cfg Alarm : remote local
Alarm Status :

```

```

=====
Traffic Statistics
=====

```

|         | Input | Output |
|---------|-------|--------|
| Octets  | 0     | 0      |
| Packets | 0     | 0      |
| Errors  | 0     | 0      |

```

=====
Ethernet Statistics
=====

```

|                   |   |                    |   |
|-------------------|---|--------------------|---|
| Broadcast Pckts : | 0 | Drop Events :      | 0 |
| Multicast Pckts : | 0 | CRC/Align Errors : | 0 |
| Undersize Pckts : | 0 | Fragments :        | 0 |
| Oversize Pckts :  | 0 | Jabbers :          | 0 |
| Collisions :      | 0 |                    |   |

|                                  |   |
|----------------------------------|---|
| Octets :                         | 0 |
| Packets :                        | 0 |
| Packets of 64 Octets :           | 0 |
| Packets of 65 to 127 Octets :    | 0 |
| Packets of 128 to 255 Octets :   | 0 |
| Packets of 256 to 511 Octets :   | 0 |
| Packets of 512 to 1023 Octets :  | 0 |
| Packets of 1024 to 1518 Octets : | 0 |
| Packets of 1519 or more Octets : | 0 |

```

=====
Port Statistics
=====

```

|                        | Input | Output |
|------------------------|-------|--------|
| Unicast Packets        | 0     | 0      |
| Multicast Packets      | 0     | 0      |
| Broadcast Packets      | 0     | 0      |
| Discards               | 0     | 0      |
| Unknown Proto Discards | 0     |        |

```

=====
Ethernet-like Medium Statistics
=====

```

|                    |   |                   |   |
|--------------------|---|-------------------|---|
| Alignment Errors : | 0 | Sngl Collisions : | 0 |
| FCS Errors :       | 0 | Mult Collisions : | 0 |

```

SQE Test Errors : 0 Late Collisions : 0
CSE : 0 Excess Collisns : 0
Too long Frames : 0 Int MAC Tx Errs : 0
Symbol Errors : 0 Int MAC Rx Errs : 0
In Pause Frames : 0 Out Pause Frames : 0
=====
=====
Ethernet CFM Loopback Statistics N/A
=====
Queue Statistics
=====
=====
Egress Queue 1 Packets Octets
 In Profile forwarded : 0 0
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
=====
*A:7705custDoc:Sar18#

```

**Table 71 Show Port Detail Output Fields (Ring Ethernet)**

| Label                     | Description                                                                                                      |
|---------------------------|------------------------------------------------------------------------------------------------------------------|
| <b>Ethernet Interface</b> |                                                                                                                  |
| Description               | A text description of the port                                                                                   |
| Interface                 | The port ID displayed in the <i>slot/mda/port</i> format                                                         |
| Oper Speed                | The operating speed of the interface                                                                             |
| Link-level                | Ethernet: the port is configured as Ethernet                                                                     |
| Config Speed              | The configured speed of the interface                                                                            |
| Admin State               | up: the port is administratively up                                                                              |
|                           | down: the port is administratively down                                                                          |
| Oper Duplex               | The operating duplex mode of the interface                                                                       |
| Oper State                | up: the port is operationally up                                                                                 |
|                           | down: the port is operationally down                                                                             |
| Config Duplex             | full: the link is configured to full-duplex mode                                                                 |
|                           | half: the link is configured to half-duplex mode                                                                 |
| Physical Link             | Yes: a physical link is present                                                                                  |
|                           | No: a physical link is not present                                                                               |
| MTU                       | The size of the largest packet that can be sent/received on the Ethernet physical interface, specified in octets |

**Table 71 Show Port Detail Output Fields (Ring Ethernet) (Continued)**

| Label             | Description                                                                                                                                                                                      |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Single Fiber Mode | Yes: single fiber mode                                                                                                                                                                           |
|                   | No: not single fiber mode                                                                                                                                                                        |
| IfIndex           | The interface's index number, which reflects its initialization sequence                                                                                                                         |
| Hold time up      | The link-up dampening time in seconds<br>The port link dampening timer value that reduces the number of link transitions reported to upper layer protocols                                       |
| Last State Change | The last time that the operational status of the port changed state                                                                                                                              |
| Hold time down    | The link-down dampening time in seconds. The down timer controls the dampening timer for link down transitions.                                                                                  |
| Last Cleared Time | The time since the last clear                                                                                                                                                                    |
| DDM Events        | Enabled: digital diagnostic monitoring events is enabled for the port                                                                                                                            |
|                   | Disabled: digital diagnostic monitoring events is disabled for the port                                                                                                                          |
| Configured Mode   | network: the port is configured for transport network use                                                                                                                                        |
|                   | access: the port is configured for service access                                                                                                                                                |
| Encap Type        | null: ingress frames will not use any tags or labels to delineate a service                                                                                                                      |
|                   | dot1q: ingress frames carry 802.1Q tags, where each tag signifies a different service                                                                                                            |
|                   | null&dot1q: applies only to port 1 and port 2 on the 2-port 10GigE (Ethernet) Adapter card and 2-port 10GigE (Ethernet) module. The encapsulation type for these ports is not user-configurable. |
| Dot1Q Ethertype   | The protocol carried in a dot1q Ethernet frame                                                                                                                                                   |
| VLAN Filter       | The filter ID of the VLAN filter                                                                                                                                                                 |
| Ing. Pool % Rate  | The amount of ingress buffer space, expressed as a percentage of the available buffer space, that will be allocated to the port for ingress buffering                                            |

**Table 71 Show Port Detail Output Fields (Ring Ethernet) (Continued)**

| Label                | Description                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Egr. Pool % Rate     | The amount of egress buffer space, expressed as a percentage of the available buffer space, that will be allocated to the port for egress buffering                                                                                                                                                                                                                                                                            |
| Net. Egr. Queue Pol. | The number of the associated network egress queue QoS policy, or default if the default policy is used                                                                                                                                                                                                                                                                                                                         |
| Net. Scheduler Mode  | The mode for servicing CoS queues; 16-priority scheduling is the only supported value                                                                                                                                                                                                                                                                                                                                          |
| Auto-negotiate       | true: the link attempts to automatically negotiate the link speed and duplex parameters                                                                                                                                                                                                                                                                                                                                        |
|                      | false: the duplex and speed values are used for the link                                                                                                                                                                                                                                                                                                                                                                       |
| MDI/MDX              | Ethernet type                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Config Phy-tx-clock  | The mode used to establish timing control of a 1000Base-T port. The options are: <ul style="list-style-type: none"> <li>• N/A— the port does not support 1000Base-T</li> <li>• auto-pref-master—prefers to be master during autonegotiation</li> <li>• auto-pref-slave—prefers to be slave during autonegotiation</li> <li>• slave—the port is forced to be slave</li> <li>• master—the port is forced to be master</li> </ul> |
| Oper Phy-tx-clock    | The operational value of the master-slave relationship of the 1000Base-T physical layer transmit clock. The options are: <ul style="list-style-type: none"> <li>• N/A— the port or the inserted SFP does not support 1000Base-T, the port is down, or negotiation failed</li> <li>• slave—the port is slave</li> <li>• master—the port is master</li> </ul>                                                                    |
| Egress Rate          | The maximum amount of egress bandwidth (in kilobits per second) that this Ethernet interface can generate                                                                                                                                                                                                                                                                                                                      |
| Ingress Rate         | The maximum amount of ingress bandwidth (in kilobits per second) that this Ethernet interface can generate                                                                                                                                                                                                                                                                                                                     |
| Ingress CBS (bytes)  | Indicates the ingress committed buffer space                                                                                                                                                                                                                                                                                                                                                                                   |
| Src-pause            | A notification to slow down the transmission rate when it exceeds the bandwidth limit                                                                                                                                                                                                                                                                                                                                          |
| LACP Tunnel          | Indicates whether LACP packet tunneling is enabled                                                                                                                                                                                                                                                                                                                                                                             |



**Table 71 Show Port Detail Output Fields (Ring Ethernet) (Continued)**

| Label              | Description                                                                                                                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Down-when-looped   | Enabled: The down-when-looped feature is enabled on the port                                                                                                                                                        |
|                    | Disabled: The down-when-looped feature is disabled on the port                                                                                                                                                      |
| Keep-alive         | The time interval between keepalive PDUs transmitted toward the network during loop detection by the down-when-looped feature                                                                                       |
| Loop Detected      | Indicates whether a loop is detected on the port                                                                                                                                                                    |
| Retry              | The minimum wait time before the port is re-enabled after it is brought down due to a loop detection                                                                                                                |
| Use Broadcast Addr | Indicates whether the down-when-looped feature has been configured to compare the destination MAC address of received PDUs to the broadcast MAC address instead of the MAC address of the port                      |
| Loopback           | The type of loopback configured on the port, either line, internal, or none                                                                                                                                         |
| Swap Mac Addr.     | Indicates whether MAC address swapping is enabled                                                                                                                                                                   |
| Loopback Time Left | The number of seconds left in a timed loopback<br>If there is no loopback configured or the configured loopback is latched, the value is unspecified.<br>If configured loopback is persistent, the value persistent |
| Cfm Loopback       | Indicates whether the CFM loopback is high priority, low priority, dot1p, or disabled                                                                                                                               |
| Cfm Loopback Vlan  | Indicates the VLAN IDs for VLANs that have a CFM loopback enabled                                                                                                                                                   |
| Sync. Status Msg.  | Indicates whether Synchronization Status Messaging is enabled on the port                                                                                                                                           |
| Rx Quality Level   | The Synchronization Status Messaging quality level value received on the port                                                                                                                                       |
| PTP Asymmetry      | Indicates whether PTP asymmetry is enabled                                                                                                                                                                          |
| Edge Timestamp     | Indicates whether the edge timestamp is enabled                                                                                                                                                                     |
| Timestamp Capable  | Indicates whether the port is timestamp-capable                                                                                                                                                                     |
| Code-Type          | The Synchronization Status Messaging quality level code type, either SONET or SDH                                                                                                                                   |

**Table 71 Show Port Detail Output Fields (Ring Ethernet) (Continued)**

| Label                      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Configured Address         | The base chassis Ethernet MAC address                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Hardware Address           | The interface hardware- or system-assigned MAC address at its protocol sublayer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Cfg Alarm                  | The type of alarms to be logged and reported for the port                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Alarm Status               | The current alarm state                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Traffic Statistics</b>  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Octets Input/Output        | The total number of octets received and transmitted on the port                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Packets Input/Output       | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                                                                                                         |
| Errors Input/Output        | <p>For packet-oriented interfaces, the number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol. For character-oriented or fixed-length interfaces, the number of inbound transmission units that contained errors preventing them from being deliverable to a higher-layer protocol.</p> <p>For packet-oriented interfaces, the number of outbound packets that could not be transmitted because of errors. For character-oriented or fixed-length interfaces, the number of outbound transmission units that could not be transmitted because of errors.</p> |
| <b>Ethernet Statistics</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Broadcast Pckts            | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or multicast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a unicast or multicast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                                                                                                             |

**Table 71 Show Port Detail Output Fields (Ring Ethernet) (Continued)**

| Label                  | Description                                                                                                                                                                                                                                                                                                                                                                 |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Multicast Pckts        | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a unicast or broadcast address at this sublayer, including those that were discarded or not sent. |
| Undersize Pckts        | The total number of packets received that were shorter than 64 octets (excluding framing bits, but including FCS octets) but were otherwise well formed                                                                                                                                                                                                                     |
| Oversize Pckts         | The total number of packets received that were longer than 1518 octets (excluding framing bits, but including FCS octets) but were otherwise well formed                                                                                                                                                                                                                    |
| Collisions             | The best estimate of the total number of collisions on this Ethernet segment                                                                                                                                                                                                                                                                                                |
| Drop Events            | The total number of times that packets were detected as being dropped due to a lack of resources (not necessarily the total number of packets dropped)                                                                                                                                                                                                                      |
| CRC/Align Errors       | The total number of packets received that were between 64 and 1518 octets (excluding framing bits but including FCS octets) that had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error)                                                                              |
| Fragments              | The total number of packets received that were shorter than 64 octets (excluding framing bits but including FCS octets) that had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error)                                                                                  |
| Jabbers                | The total number of packets received that were longer than 1518 octets (excluding framing bits but including FCS octets) that had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error)                                                                                 |
| Octets                 | Total number of octets received                                                                                                                                                                                                                                                                                                                                             |
| Packets                | Number of packets received, broken down by size                                                                                                                                                                                                                                                                                                                             |
| <b>Port Statistics</b> |                                                                                                                                                                                                                                                                                                                                                                             |

**Table 71 Show Port Detail Output Fields (Ring Ethernet) (Continued)**

| Label                                  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Unicast Packets Input/Output           | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                   |
| Multicast Packets Input/Output         | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a unicast or broadcast address at this sublayer, including those that were discarded or not sent                                                                                                                                                        |
| Broadcast Packets Input/Output         | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or multicast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a unicast or multicast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                       |
| Discards Input/Output                  | The number of inbound/outbound packets chosen to be discarded to possibly free up buffer space                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Unknown Proto Discards Input/Output    | For packet-oriented interfaces, the number of packets received via the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received via the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0. Unknown proto discards do not show up in the packet counts |
| <b>Ethernet-like Medium Statistics</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Alignment Errors                       | The total number of packets received that had a length (excluding framing bits, but including FCS octets) of between 64 and 1518 octets, inclusive, but that had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets                                                                                                                                                                                                                          |

**Table 71 Show Port Detail Output Fields (Ring Ethernet) (Continued)**

| Label                                          | Description                                                                                                                   |
|------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| FCS Errors                                     | The number of frames received that are an integral number of octets in length but do not pass the FCS check                   |
| SQE Errors                                     | The number of times that the SQE TEST ERROR is received                                                                       |
| CSE                                            | The number of times that the carrier sense condition was lost or never asserted when attempting to transmit a frame           |
| Too long Frames                                | The number of frames received that exceed the maximum permitted frame size                                                    |
| Symbol Errors                                  | For an interface operating at 100 Mb/s, the number of times there was an invalid data symbol when a valid carrier was present |
| In Pause Frames                                | The number of IEEE 802.3x pause frames received for flow control; traffic is momentarily disrupted                            |
| Sngl Collisions                                | The number of frames that are involved in a single collision, and are subsequently transmitted successfully                   |
| Mult Collisions                                | The number of frames that are involved in more than one collision and are subsequently transmitted successfully               |
| Late Collisions                                | The number of times that a collision is detected later than one slotTime into the transmission of a packet                    |
| Excess Collisns                                | The number of frames for which a transmission fails due to excessive collisions                                               |
| Int MAC Tx Errs                                | The number of frames for which a transmission fails due to an internal MAC sublayer transmit error                            |
| Int MAC Rx Errs                                | The number of frames for which a reception fails due to an internal MAC sublayer receive error                                |
| Out Pause Frames                               | The number of IEEE 802.3x pause frames sent for flow control; traffic is momentarily disrupted                                |
| <b>Ethernet CFM Loopback Statistics    N/A</b> |                                                                                                                               |
| <b>Queue Statistics</b>                        |                                                                                                                               |
| Egress Queue                                   | In Profile forwarded/dropped                                                                                                  |
|                                                | Out Profile forwarded/dropped                                                                                                 |

**Output Example**

```

sar18# show port 1/11/v-port detail
=====
Ethernet Interface
=====
Description : 2.5G Virtual Ethernet Port
Interface : 1/11/v-port Oper Speed : 2.50 Gbps
Link-level : Ethernet Config Speed : N/A
Admin State : up Oper Duplex : N/A
Oper State : up Config Duplex : N/A
Physical Link : Yes MTU : 1572
Single Fiber Mode : No
IfIndex : 39944192 Hold time up : N/A
Last State Change : 11/03/2012 21:30:51 Hold time down : N/A
Last Cleared Time : N/A

Configured Mode : network Encap Type : null
Dot1Q Ethertype : 0x8100 QinQ Ethertype : 0x8100
Ing. Pool % Rate : 100 Egr. Pool % Rate : 100
Net. Egr. Queue Pol: r.nw.q4
Net. Scheduler Mode: 16-priority
Auto-negotiate : N/A MDI/MDX : N/A
Config Phy-tx-clock: not-applicable Oper Phy-tx-clock: N/A
Allow Eth-BN : True
BN Egr.Rate in use : 765000 Eth-BN hold time : 6
Egress Rate : Default Ingress Rate : Default
Ingress CBS(bytes) : 130816 Src-pause : Disabled
 LACP Tunnel : N/A

Down-when-looped : Disabled Keep-alive : 10
Loop Detected : False Retry : 120
Use Broadcast Addr : False

Loopback : none Swap Mac Addr : Disabled
Loopback Time Left : unspecified
Cfm Loopback : Disabled

Sync. Status Msg. : Disabled Rx Quality Level : N/A

PTP Asymmetry : N/A Edge Timestamp : Disable
Timestamp Capable : False

CRC Mon SD Thresh : Disabled CRC Mon Window : 10 seconds
CRC Mon SF Thresh : Disabled

Configured Address :
Hardware Address :
Cfg Alarm : N/A
Alarm Status : N/A

=====
Traffic Statistics
=====
 Input Output

Octets 0 0
Packets 0 0
Errors 0 0

```

```

=====
Ethernet Statistics
=====
Broadcast Pkts : 0 Drop Events : 0
Multicast Pkts : 0 CRC/Align Errors : 0
Undersize Pkts : 0 Fragments : 0
Oversize Pkts : 0 Jabbers : 0
Collisions : 0
Octets : 0
Packets : 0
Packets of 64 Octets : 0
Packets of 65 to 127 Octets : 0
Packets of 128 to 255 Octets : 0
Packets of 256 to 511 Octets : 0
Packets of 512 to 1023 Octets : 0
Packets of 1024 to 1518 Octets : 0
Packets of 1519 or more Octets : 0
=====

Port Statistics
=====
 Input Output

Unicast Packets 0 0
Multicast Packets 0 0
Broadcast Packets 0 0
Discards 0 0
Unknown Proto Discards 0
=====

Port Discard Statistics
=====
 Input Output

Inv L2 Packets : 0 Port MTU Exceeded: 0
Inv MPLS Labels : 0
Inv IP Packets : 0
H.Policed Packets : 0
CSM Ingress Queues
 Hi : 0 CSM Egress Queues
 Medium : 0 Common : 0
 Low : 0
=====

Ethernet-like Medium Statistics
=====
Alignment Errors : 0 Sngl Collisions : 0
FCS Errors : 0 Mult Collisions : 0
SQE Test Errors : 0 Late Collisions : 0
CSE : 0 Excess Collisns : 0
Too long Frames : 0 Int MAC Tx Errs : 0
Symbol Errors : 0 Int MAC Rx Errs : 0
In Pause Frames : 0 Out Pause Frames : 0
=====

Ethernet CFM Statistics
=====
Cfm LbmRx : 0
Cfm LbReplyTx : 0 Cfm LbmDropped : 0

```

```

Num Bn Rate Chng : 1 Last BnRateChng : 04/12/2017 21:20:53
Valid BnmRx : 2 Last Valid BnmRx : 04/12/2017 21:21:10
Invalid BnmRx : 0
BnmOutOfRangeBW : 0
=====
Queue Statistics
=====

Add-drop Port Queue 1 Packets Octets
 In Profile forwarded : 8700493441110376715 8700493580567332216
 In Profile dropped : 243616594368814244 2209638931652
 Out Profile forwarded : 12884901891 8700494542739924144
 Out Profile dropped : 143944465151581384 284544364229582056
Ingress Queue 1 Packets Octets
 In Profile forwarded : 0 0
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
Ingress Queue 9 Packets Octets
 In Profile forwarded : 0 0
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
Ingress Queue CTL Packets Octets
 Forwarded : 0 0
 Dropped : 0 N/A
Egress Queue 1 Packets Octets
 In Profile forwarded : 0 0
 In Profile dropped : 0 0
 Out Profile forwarded : 0 0
 Out Profile dropped : 0 0
Egress Queue CTL Packets Octets
 Forwarded : 0 0
 Dropped : 0 N/A
=====

```

**Table 72** Show Port Detail Output Fields (v-port)

| Label                     | Description                                              |
|---------------------------|----------------------------------------------------------|
| <b>Ethernet Interface</b> |                                                          |
| Description               | A text description of the port                           |
| Interface                 | The port ID displayed in the <i>slot/mda/port</i> format |
| Oper Speed                | The operating speed of the interface                     |
| Link-level                | Ethernet: the port is configured as Ethernet             |
| Config Speed              | The configured speed of the interface                    |
| Admin State               | up: the port is administratively up                      |
|                           | down: the port is administratively down                  |



**Table 72 Show Port Detail Output Fields (v-port) (Continued)**

| Label             | Description                                                                                                                                                                                      |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Oper Duplex       | The operating duplex mode of the interface                                                                                                                                                       |
| Oper State        | up: the port is operationally up                                                                                                                                                                 |
|                   | down: the port is operationally down                                                                                                                                                             |
| Config Duplex     | full: the link is configured to full-duplex mode                                                                                                                                                 |
|                   | half: the link is configured to half-duplex mode                                                                                                                                                 |
| Physical Link     | Yes: a physical link is present                                                                                                                                                                  |
|                   | No: a physical link is not present                                                                                                                                                               |
| MTU               | The size of the largest packet that can be sent/received on the Ethernet physical interface, specified in octets                                                                                 |
| Single Fiber Mode | Yes: single fiber mode                                                                                                                                                                           |
|                   | No: not single fiber mode                                                                                                                                                                        |
| IfIndex           | The interface's index number, which reflects its initialization sequence                                                                                                                         |
| Hold time up      | The link-up dampening time in seconds<br>The port link dampening timer value that reduces the number of link transitions reported to upper layer protocols                                       |
| Last State Change | The last time that the operational status of the port changed state                                                                                                                              |
| Hold time down    | The link-down dampening time in seconds. The down timer controls the dampening timer for link down transitions.                                                                                  |
| Configured Mode   | network: the port is configured for transport network use                                                                                                                                        |
|                   | access: the port is configured for service access                                                                                                                                                |
| Encap Type        | null: ingress frames will not use any tags or labels to delineate a service                                                                                                                      |
|                   | dot1q: ingress frames carry 802.1Q tags, where each tag signifies a different service                                                                                                            |
|                   | null&dot1q: applies only to port 1 and port 2 on the 2-port 10GigE (Ethernet) Adapter card and 2-port 10GigE (Ethernet) module. The encapsulation type for these ports is not user-configurable. |

**Table 72 Show Port Detail Output Fields (v-port) (Continued)**

| Label                | Description                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Dot1Q Ethertype      | The protocol carried in a dot1q Ethernet frame                                                                                                                                                                                                                                                                                                                                                                                |
| QinQ Ethertype       | The protocol carried in a QinQ Ethernet frame                                                                                                                                                                                                                                                                                                                                                                                 |
| Ing. Pool % Rate     | The amount of ingress buffer space, expressed as a percentage of the available buffer space, that will be allocated to the port for ingress buffering                                                                                                                                                                                                                                                                         |
| Egr. Pool % Rate     | The amount of egress buffer space, expressed as a percentage of the available buffer space, that will be allocated to the port for egress buffering                                                                                                                                                                                                                                                                           |
| Net. Egr. Queue Pol. | The number of the associated network egress queue QoS policy, or default if the default policy is used                                                                                                                                                                                                                                                                                                                        |
| Auto-negotiate       | true: the link attempts to automatically negotiate the link speed and duplex parameters                                                                                                                                                                                                                                                                                                                                       |
|                      | false: the duplex and speed values are used for the link                                                                                                                                                                                                                                                                                                                                                                      |
| Net. Scheduler Mode  | The mode for servicing CoS queues; 16-priority scheduling is the only supported value                                                                                                                                                                                                                                                                                                                                         |
| MDI/MDX              | Ethernet type                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Config Phy-tx-clock  | The mode used to establish timing control of a 1000Base-T port. The options are: <ul style="list-style-type: none"> <li>• N/A—the port does not support 1000Base-T</li> <li>• auto-pref-master—prefers to be master during autonegotiation</li> <li>• auto-pref-slave—prefers to be slave during autonegotiation</li> <li>• slave—the port is forced to be slave</li> <li>• master—the port is forced to be master</li> </ul> |
| Oper Phy-tx-clock    | The operational value of the master-slave relationship of the 1000Base-T physical layer transmit clock. The options are: <ul style="list-style-type: none"> <li>• N/A—the port or the inserted SFP does not support 1000Base-T, the port is down, or negotiation failed</li> <li>• slave—the port is slave</li> <li>• master—the port is master</li> </ul>                                                                    |
| Allow Eth-BN         | Indicates whether Ethernet Bandwidth Notification (ETH-BN) is allowed on the port: True or False                                                                                                                                                                                                                                                                                                                              |

**Table 72 Show Port Detail Output Fields (v-port) (Continued)**

| Label               | Description                                                                                                                                                                                                         |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| BN Egr.Rate in use  | The egress rate in use based on the request from the ETH-BN server MEP                                                                                                                                              |
| Eth-BN hold time    | The configured hold time (in seconds) between an egress rate change based on a received Bandwidth Notification Message (BNM) and the next change request that will be accepted                                      |
| Egress Rate         | The maximum amount of egress bandwidth (in kilobits per second) that this Ethernet interface can generate                                                                                                           |
| Ingress Rate        | The maximum amount of ingress bandwidth (in kilobits per second) that this Ethernet interface can generate                                                                                                          |
| Ingress CBS (bytes) | Indicates the ingress committed buffer space                                                                                                                                                                        |
| Src-pause           | A notification to slow down the transmission rate when it exceeds the bandwidth limit                                                                                                                               |
| LACP Tunnel         | Indicates whether LACP packet tunneling is enabled                                                                                                                                                                  |
| Down-when-looped    | Enabled: The down-when-looped feature is enabled on the port                                                                                                                                                        |
|                     | Disabled: The down-when-looped feature is disabled on the port                                                                                                                                                      |
| Keep-alive          | The time interval between keepalive PDUs transmitted toward the network during loop detection by the down-when-looped feature                                                                                       |
| Loop Detected       | Indicates whether a loop is detected on the port                                                                                                                                                                    |
| Retry               | The minimum wait time before the port is re-enabled after it is brought down due to a loop detection                                                                                                                |
| Use Broadcast Addr  | Indicates whether the down-when-looped feature has been configured to compare the destination MAC address of received PDUs to the broadcast MAC address instead of the MAC address of the port                      |
| Loopback            | The type of loopback configured on the port, either line, internal, or none                                                                                                                                         |
| Swap Mac Addr.      | Indicates whether MAC address swapping is enabled                                                                                                                                                                   |
| Loopback Time Left  | The number of seconds left in a timed loopback<br>If there is no loopback configured or the configured loopback is latched, the value is unspecified.<br>If configured loopback is persistent, the value persistent |

**Table 72 Show Port Detail Output Fields (v-port) (Continued)**

| Label                     | Description                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cfm Loopback              | Indicates whether the CFM loopback is high priority, low priority, dot1p, or disabled                                                                                                                                                                                                                                                                                           |
| Sync. Status Msg.         | Indicates whether Synchronization Status Messaging is enabled on the port                                                                                                                                                                                                                                                                                                       |
| Rx Quality Level          | The Synchronization Status Messaging quality level value received on the port                                                                                                                                                                                                                                                                                                   |
| PTP Asymmetry             | Indicates whether PTP asymmetry is enabled                                                                                                                                                                                                                                                                                                                                      |
| Edge Timestamp            | Indicates whether the edge timestamp is enabled                                                                                                                                                                                                                                                                                                                                 |
| Timestamp Capable         | Indicates whether the port is timestamp-capable                                                                                                                                                                                                                                                                                                                                 |
| CRC Mon SD Thresh         | Indicates the CRC signal degrade threshold value (1 to 9), if enabled                                                                                                                                                                                                                                                                                                           |
| CRC Mon SF Thresh         | Indicates the CRC signal fail threshold value (1 to 9), if enabled                                                                                                                                                                                                                                                                                                              |
| CRC Mon Window            | Indicates the CRC window sampling size value (5 to 60)                                                                                                                                                                                                                                                                                                                          |
| Configured Address        | The base chassis Ethernet MAC address                                                                                                                                                                                                                                                                                                                                           |
| Hardware Address          | The interface hardware- or system-assigned MAC address at its protocol sublayer                                                                                                                                                                                                                                                                                                 |
| Cfg Alarm                 | The type of alarms to be logged and reported for the port                                                                                                                                                                                                                                                                                                                       |
| Alarm Status              | The current alarm state                                                                                                                                                                                                                                                                                                                                                         |
| <b>Traffic Statistics</b> |                                                                                                                                                                                                                                                                                                                                                                                 |
| Octets Input/Output       | The total number of octets received and transmitted on the port                                                                                                                                                                                                                                                                                                                 |
| Packets Input/Output      | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent. |

**Table 72 Show Port Detail Output Fields (v-port) (Continued)**

| Label                      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Errors Input/Output        | <p>For packet-oriented interfaces, the number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol. For character-oriented or fixed-length interfaces, the number of inbound transmission units that contained errors preventing them from being deliverable to a higher-layer protocol.</p> <p>For packet-oriented interfaces, the number of outbound packets that could not be transmitted because of errors. For character-oriented or fixed-length interfaces, the number of outbound transmission units that could not be transmitted because of errors.</p> |
| <b>Ethernet Statistics</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Broadcast Pckts            | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or multicast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a unicast or multicast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                                                                                                             |
| Multicast Pckts            | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a unicast or broadcast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                                                                                                             |
| Undersize Pckts            | The total number of packets received that were shorter than 64 octets (excluding framing bits, but including FCS octets) but were otherwise well formed                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Oversize Pckts             | The total number of packets received that were longer than 1518 octets (excluding framing bits, but including FCS octets) but were otherwise well formed                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Collisions                 | The best estimate of the total number of collisions on this Ethernet segment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Drop Events                | The total number of times that packets were detected as being dropped due to a lack of resources (not necessarily the total number of packets dropped)                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

**Table 72 Show Port Detail Output Fields (v-port) (Continued)**

| Label                          | Description                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CRC/Align Errors               | The total number of packets received that were between 64 and 1518 octets (excluding framing bits but including FCS octets) that had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error)                                                                                  |
| Fragments                      | The total number of packets received that were shorter than 64 octets (excluding framing bits but including FCS octets) that had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error)                                                                                      |
| Jabbers                        | The total number of packets received that were longer than 1518 octets (excluding framing bits but including FCS octets) that had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error)                                                                                     |
| Octets                         | Total number of octets received                                                                                                                                                                                                                                                                                                                                                 |
| Packets                        | Number of packets received                                                                                                                                                                                                                                                                                                                                                      |
| Packets of <i>n</i> Octets     | Number of packets received, broken down by size                                                                                                                                                                                                                                                                                                                                 |
| <b>Port Statistics</b>         |                                                                                                                                                                                                                                                                                                                                                                                 |
| Unicast Packets Input/Output   | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent. |
| Multicast Packets Input/Output | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a unicast or broadcast address at this sublayer, including those that were discarded or not sent      |

**Table 72 Show Port Detail Output Fields (v-port) (Continued)**

| Label                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Broadcast Packets Input/Output      | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or multicast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a unicast or multicast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                       |
| Discards Input/Output               | The number of inbound/outbound packets chosen to be discarded to possibly free up buffer space                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Unknown Proto Discards Input/Output | For packet-oriented interfaces, the number of packets received via the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received via the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0. Unknown proto discards do not show up in the packet counts |
| <b>Port Discard Statistics</b>      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Inv L2 Packets Input                | The number of invalid packets that are discarded due to an unknown Layer 2 ID                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Port MTU Exceeded Output            | Indicates that the port MTU has been exceeded                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Inv MPLS Labels Input               | The number of MPLS labels discarded                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Inv IP Packets Input                | The number of invalid IP packets that are discarded                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| H. Policed Packets Input            | The number of packets that are discarded due to hard policing                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| CSM Ingress Queues Input            | The number of incoming control packets discarded                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| CSM Egress Queues Output            | The number of outgoing control packets discarded                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

**Table 72 Show Port Detail Output Fields (v-port) (Continued)**

| Label                                  | Description                                                                                                                                                                                                                                                                                              |
|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Ethernet-like Medium Statistics</b> |                                                                                                                                                                                                                                                                                                          |
| Alignment Errors                       | The total number of packets received that had a length (excluding framing bits, but including FCS octets) of between 64 and 1518 octets, inclusive, but that had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets |
| FCS Errors                             | The number of frames received that are an integral number of octets in length but do not pass the FCS check                                                                                                                                                                                              |
| SQE Errors                             | The number of times that the SQE TEST ERROR is received                                                                                                                                                                                                                                                  |
| CSE                                    | The number of times that the carrier sense condition was lost or never asserted when attempting to transmit a frame                                                                                                                                                                                      |
| Too long Frames                        | The number of frames received that exceed the maximum permitted frame size                                                                                                                                                                                                                               |
| Symbol Errors                          | For an interface operating at 100 Mb/s, the number of times there was an invalid data symbol when a valid carrier was present                                                                                                                                                                            |
| In Pause Frames                        | The number of IEEE 802.3x pause frames received for flow control; traffic is momentarily disrupted                                                                                                                                                                                                       |
| Sngl Collisions                        | The number of frames that are involved in a single collision, and are subsequently transmitted successfully                                                                                                                                                                                              |
| Mult Collisions                        | The number of frames that are involved in more than one collision and are subsequently transmitted successfully                                                                                                                                                                                          |
| Late Collisions                        | The number of times that a collision is detected later than one slotTime into the transmission of a packet                                                                                                                                                                                               |
| Excess Collisns                        | The number of frames for which a transmission fails due to excessive collisions                                                                                                                                                                                                                          |
| Int MAC Tx Errs                        | The number of frames for which a transmission fails due to an internal MAC sublayer transmit error                                                                                                                                                                                                       |
| Int MAC Rx Errs                        | The number of frames for which a reception fails due to an internal MAC sublayer receive error                                                                                                                                                                                                           |
| Out Pause Frames                       | The number of IEEE 802.3x pause frames sent for flow control; traffic is momentarily disrupted                                                                                                                                                                                                           |



**Table 72 Show Port Detail Output Fields (v-port) (Continued)**

| Label                          | Description                                                                                                                                                                                                                                    |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Ethernet CFM Statistics</b> |                                                                                                                                                                                                                                                |
| Cfm LbmRx                      | The number of LBMs received                                                                                                                                                                                                                    |
| Cfm LbReplyTx                  | The number of LBRs transmitted                                                                                                                                                                                                                 |
| Cfm LbmDropped                 | The number of LBMs dropped                                                                                                                                                                                                                     |
| Num Bn Rate Chng               | The number of times that the port egress rate is dynamically changed based on Bandwidth Notification (BN) messages<br>Note: not every bandwidth change indicated by a BNM triggers a port egress rate change                                   |
| Last BnRateChng                | The time that the port egress rate was last changed based on a BNM                                                                                                                                                                             |
| Valid BnmRx                    | The number of valid BN messages received                                                                                                                                                                                                       |
| Last Valid BnmRx               | The time that the last valid BNM was received                                                                                                                                                                                                  |
| Invalid BnmRx                  | The number of invalid BN messages received                                                                                                                                                                                                     |
| BnmOutOfRangeBW                | The number of BN messages received with a requested bandwidth that was out of range                                                                                                                                                            |
| <b>Queue Statistics</b>        |                                                                                                                                                                                                                                                |
| Add-drop Port Queue            | In Profile forwarded/dropped                                                                                                                                                                                                                   |
|                                | Out Profile forwarded/dropped                                                                                                                                                                                                                  |
| Ingress Queue                  | In Profile forwarded/dropped                                                                                                                                                                                                                   |
|                                | Out Profile forwarded/dropped                                                                                                                                                                                                                  |
| Ingress Queue CTL              | The number of forwarded packets and octets, and the number of dropped packets, for the ingress control queue. For access ports, this statistic applies only to Ethernet cards. For network ports, this statistic applies to all adapter cards. |
| Egress Queue                   | In Profile forwarded/dropped                                                                                                                                                                                                                   |
|                                | Out Profile forwarded/dropped                                                                                                                                                                                                                  |
| Egress Queue CTL               | The number of forwarded packets and octets, and the number of dropped packets, for the egress control queue. For access ports, this statistic applies only to Ethernet cards. For network ports, this statistic applies to all adapter cards.  |

**Output Example**

```

*A:ALU-1>config# show port 1/3/1.e1 detail
=====
TDM DS1 Interface
=====
Description : E1
Interface : 1/3/1.e1
Type : e1
Admin Status : down
Physical Link : no
Clock Sync State : normal
Signal Mode : cas
Last State Change : 10/30/2008 14:40:26
Loopback : none
Remote Loop respond: N/A
Load-balance-algo : default
Cfg Alarm : ais los ber-sd ber sf
Alarm Status :
BER SD Threshold : 10
BER SF Threshold : 10
Hold time up : 0 milliseconds
Hold time down : 0 milliseconds
Sync. Status Msg. : Enabled
Ssm-bit : 6
Rx Quality Level : 0x02(prc)
Framing : g704
Oper Status : down
Clock Source : node-timed
Channel IfIndex : 576749569
In Remote Loop : N/A
Egr. Sched. Pol : N/A
Tx DUS/DNU : Disabled
Tx Quality Level : 0x02(prc)
=====
Traffic Statistics
=====
 Input Output

Octets 0 0
Packets 0 0
Errors 0 0
=====
DS1/E1 Line
=====

ES 0
SES 0
SEFS 0
UAS 0
CSS 0
PCV 0
LES 0
BES 0
LCV : 0
=====
Transmit:
FE-LOF : 0
AIS : 0
Receive:
FE-LOF : 0
AIS : 0
LOS : 0
LOF : 0
Looped : 0
=====
DS1/E1 CAS Signalling Bits

```

| =====                  |            |            |          |            |            |
|------------------------|------------|------------|----------|------------|------------|
| Timeslot               | Rx<br>ABCD | Tx<br>ABCD | Timeslot | Rx<br>ABCD | Tx<br>ABCD |
| -----                  |            |            |          |            |            |
| 1                      | n/a        | n/a        | 13       | n/a        | n/a        |
| 2                      | n/a        | n/a        | 14       | n/a        | n/a        |
| 3                      | n/a        | n/a        | 15       | n/a        | n/a        |
| 4                      | n/a        | n/a        | 16       | n/a        | n/a        |
| 5                      | n/a        | n/a        | 17       | n/a        | n/a        |
| 6                      | n/a        | n/a        | 18       | n/a        | n/a        |
| 7                      | n/a        | n/a        | 19       | n/a        | n/a        |
| 8                      | n/a        | n/a        | 20       | n/a        | n/a        |
| 9                      | n/a        | n/a        | 21       | n/a        | n/a        |
| 10                     | n/a        | n/a        | 22       | n/a        | n/a        |
| 11                     | n/a        | n/a        | 23       | n/a        | n/a        |
| 12                     | n/a        | n/a        | 24       | n/a        | n/a        |
| =====                  |            |            |          |            |            |
| Port Statistics        |            |            |          |            |            |
| =====                  |            |            |          |            |            |
|                        |            |            | Input    |            | Output     |
| -----                  |            |            | -----    |            | -----      |
| Packets                |            |            | 0        |            | 0          |
| Discards               |            |            | 0        |            | 0          |
| Unknown Proto Discards |            |            | 0        |            |            |
| =====                  |            |            |          |            |            |

**Table 73 Show Port Detail Output Fields (TDM DS1 Interface)**

| Label                    | Description                                                         |
|--------------------------|---------------------------------------------------------------------|
| <b>TDM DS1 Interface</b> |                                                                     |
| Description              | A text description of the port                                      |
| Interface                | The port ID displayed in the <i>slot/mda/port</i> format            |
| Type                     | The type of interface                                               |
| Admin Status             | up: the port is administratively up                                 |
|                          | down: the port is administratively down                             |
| Physical Link            | yes: a physical link is present                                     |
|                          | no: a physical link is not present                                  |
| Signal Mode              | The port signaling mode                                             |
| Last State Change        | The last time that the operational status of the port changed state |
| Loopback                 | The port loopback mode                                              |
| Remote Loop respond      | The DS1 channel response to remote loopbacks                        |
| Load-balance-algo        | The load balance algorithm used on the port                         |

**Table 73 Show Port Detail Output Fields (TDM DS1 Interface) (Continued)**

| Label                     | Description                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cfg Alarm                 | The type of alarms to be logged and reported for the port                                                                                                                                                                                                                                                                                                         |
| Alarm Status              | The current alarm state                                                                                                                                                                                                                                                                                                                                           |
| Hold time up              | The hold-timer value for link-up event dampening                                                                                                                                                                                                                                                                                                                  |
| Hold time down            | The hold-timer value for link-down event dampening                                                                                                                                                                                                                                                                                                                |
| Sync. Status Msg.         | The setting of SSM: enabled or disabled                                                                                                                                                                                                                                                                                                                           |
| Tx DUS/DNU                | The setting of <b>tx-dus</b> : enabled or disabled                                                                                                                                                                                                                                                                                                                |
| Ssm-bit                   | The Sa bit that carries the quality level value: Sa4 to Sa8                                                                                                                                                                                                                                                                                                       |
| Rx Quality Level          | The SSM QL value received on the interface                                                                                                                                                                                                                                                                                                                        |
| Tx Quality Level          | The SSM QL value transmitted on the interface                                                                                                                                                                                                                                                                                                                     |
| Framing                   | The DS1 framing to be used for the port                                                                                                                                                                                                                                                                                                                           |
| Oper Status               | up: the port is operationally up                                                                                                                                                                                                                                                                                                                                  |
|                           | down: the port is operationally down                                                                                                                                                                                                                                                                                                                              |
| Clock Source              | loop-timed: the link recovers the clock from the received data stream<br>node-timed: the link uses the internal clock when transmitting data<br>adaptive: clocking is derived from the incoming pseudowire packets<br>differential: clocking is derived from a common clock compared to differential clock recovery data in the RTP header in the TDM PW overhead |
| Clock Sync State          | The current state of the clock recovery function                                                                                                                                                                                                                                                                                                                  |
| Channel IfIndex           | The channel interface index number                                                                                                                                                                                                                                                                                                                                |
| In Remote Loop            | Indicates whether incoming remote loopback is enabled                                                                                                                                                                                                                                                                                                             |
| Egr. Sched. Pol           | The egress scheduling policy                                                                                                                                                                                                                                                                                                                                      |
| BER SD Threshold          | The configured value of the BER SD threshold                                                                                                                                                                                                                                                                                                                      |
| BER SF Threshold          | The configured value of the BER SF threshold                                                                                                                                                                                                                                                                                                                      |
| <b>Traffic Statistics</b> |                                                                                                                                                                                                                                                                                                                                                                   |
| Octets Input/Output       | The total number of octets received and transmitted on the port                                                                                                                                                                                                                                                                                                   |

**Table 73 Show Port Detail Output Fields (TDM DS1 Interface) (Continued)**

| Label                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Packets Input/Output | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                                                                                                  |
| Errors Input/Output  | For packet-oriented interfaces, the number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol. For character-oriented or fixed-length interfaces, the number of inbound transmission units that contained errors preventing them from being deliverable to a higher-layer protocol.<br><br>For packet-oriented interfaces, the number of outbound packets that could not be transmitted because of errors. For character-oriented or fixed-length interfaces, the number of outbound transmission units that could not be transmitted because of errors. |
| DS1/E1 Line          | The DS1/E1 Line statistics                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| ES                   | The number of Errored Seconds errors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| SES                  | The number of Severely Errored Seconds errors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| SEFS                 | The number of Severely Errored Framing Seconds errors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| UAS                  | The number of Unavailable Seconds errors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| CSS                  | The number of Controlled Slip Seconds errors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| PCV                  | The number of Path Code Violations errors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| LES                  | The number of Line Errored Seconds errors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| BES                  | The number of Bursty Errored Seconds alarms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| LCV                  | The number of Line Code Violations errors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Transmit             | The transmit statistics:<br>FE-LOF: the number of far-end loss of frame errors<br>AIS: the number of alarm indication signal errors                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

**Table 73 Show Port Detail Output Fields (TDM DS1 Interface) (Continued)**

| Label                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Receive                             | The receive statistics:<br>FE-LOF: the number of far-end loss of frame errors<br>AIS: the number of alarm indication signal errors<br>LOS: the number of loss of signal errors<br>LOF: the number of loss of frame errors                                                                                                                                                                                                                                                                                                          |
| Looped                              | The number of looped packet errors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| DS1/E1 CAS Signalling Bits          | The CAS signaling bit information                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Timeslot                            | The timeslot number (1 to 24 for DS1, 2 to 32 for E1)                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Rx ABCD                             | The signaling bits received in the timeslot, where each signaling bit is represented by a 1 (set) or a 0 (not set), and 0000 represents a timeslot that is in use but not receiving any signaling bits (for example, 1000 means that the A bit is set); "n/a" indicates timeslots not in use                                                                                                                                                                                                                                       |
| Tx ABCD                             | The signaling bits transmitted from the timeslot, where each signaling bit is represented by a 1 (set) or a 0 (not set), and 0000 represents a timeslot that is in use but not transmitting any signaling bits (for example, 1000 means that the A bit is set); "n/a" indicates timeslots not in use                                                                                                                                                                                                                               |
| <b>Port Statistics</b>              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Packets Input/Output                | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast, multicast, or broadcast address at this sublayer                                                                                                                                                                                                                                                                                                                                                                 |
| Discards Input/Output               | The number of inbound/outbound packets chosen to be discarded to possibly free up buffer space                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Unknown proto discards Input/Output | For packet-oriented interfaces, the number of packets received via the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received via the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0. Unknown proto discards do not show up in the packet counts. |

**Output Example**

```

*A:ALU-1># show port 1/2/1.v35
=====
Serial RS-232 Interface
=====
Description : V35
Interface : 1/2/1.v35
Type : v35
Admin Status : up Oper Status : up
Physical Link : yes Clock Source : slave
Device Mode : synchronous Speed : 64k
Character Length : N/A Parity : N/A
Stop Bits : N/A
Device Gender : dte
Last State Change : 02/13/2015 21:03:47 Duplex : full
Loopback : none Channel IfIndex : 574652417
Hold time up : 0 milliseconds
Hold time down : 0 milliseconds
Cfg Alarm :
Alarm Status :
=====

=====
Serial Control Leads
=====
Inputs Cfg Netw Line Mon

dtr-dsr [DSR] : high 1 1 off
rts-dcd [DCD] : high 1 0 off
alb-cts [CTS] : high 1 1 off

Outputs Cfg Netw Line

dsr-dtr [DTR] : high 1 1
dcd-rts [RTS] : high 1 1
cts-alb [ALB] : high 1 1

=====
Traffic Statistics
=====
 Input Output

Octets 39022208 39022016
Packets 609722 609719
Errors 0 0

=====
Port Statistics
=====
 Input Output

Packets 609722 609719
Discards 0 0
Unknown Proto Discards 0

=====

*A:ALU-1># show port 1/2/7.x21
=====

```

```

Serial RS-232 Interface
=====
Description : X21
Interface : 1/2/7.x21
Type : x21
Admin Status : up Oper Status : up
Physical Link : yes Clock Source : slave
Device Mode : synchronous Speed : 64k
Character Length : N/A Parity : N/A
Stop Bits : N/A
Device Gender : dte Duplex : full
Data Position : N/A S-Bit Signaling : N/A
Last State Change : 02/13/2015 21:03:50 Channel IfIndex : 574849031
Loopback : none
Hold time up : 0 milliseconds
Hold time down : 0 milliseconds
Cfg Alarm :
Alarm Status :
=====

```

```

=====
Serial Control Leads
=====
Inputs Cfg Netw Line Mon

c-i [I] : high 1 1 off

Outputs Cfg Netw Line

i-c [C] : high 1 1

```

```

=====
Traffic Statistics
=====
 Input Output

Octets 39403456 39403264
Packets 615679 615676
Errors 0 0

```

```

=====
Port Statistics
=====
 Input Output

Packets 615679 615676
Discards 0 0
Unknown Proto Discards 0

```

```
*A:ALU-1># show port 1/2/4.rs232
```

```

=====
Serial RS-232 Interface
=====
Description : RS232
Interface : 1/2/4.rs232
Type : rs232
Admin Status : up Oper Status : up
Physical Link : yes Clock Source : slave

```



```

Device Mode : synchronous Speed : 9600
Character Length : N/A Parity : N/A
Stop Bits : N/A Multi-Drop : disabled
Device Gender : dce Duplex : full
Data Position : F0-B5 S-Bit Signaling : on
Last State Change : 02/13/2015 21:04:16 Channel IfIndex : 574750724
Loopback : none
Hold time up : 0 milliseconds
Hold time down : 0 milliseconds
Cfg Alarm : hcmOof hcmRai
Alarm Status :

```

#### Serial Control Leads

| Inputs               | Cfg | Netw | Line | Mon |
|----------------------|-----|------|------|-----|
| dtr-dsr [DTR] : high |     | 1    | 1    | off |
| rts-dcd [RTS] : high |     | 1    | 1    | off |
| alb-cts [ALB] : high |     | 1    | 0    | off |
| rdl-ri [RDL] : high  |     | 1    | 0    | off |

| Outputs              | Cfg | Netw | Line |
|----------------------|-----|------|------|
| dsr-dtr [DSR] : high |     | 1    | 1    |
| dcd-rts [DCD] : high |     | 1    | 1    |
| cts-alb [CTS] : high |     | 1    | 1    |
| ri-rdl [RI] : high   |     | 1    | 1    |

#### Traffic Statistics

|         | Input    | Output   |
|---------|----------|----------|
| Octets  | 17935808 | 17932416 |
| Packets | 280247   | 280194   |
| Errors  | 0        | 0        |

#### Port Statistics

|                        | Input  | Output |
|------------------------|--------|--------|
| Packets                | 280247 | 280194 |
| Discards               | 0      | 0      |
| Unknown Proto Discards | 0      |        |

The following output shows is an example of raw socket statistics.

```
*A:ALU-1># show port 1/12/6.1
```

#### Serial Socket

```

Description : SOCKET
Interface : 1/12/6.1
Admin Status : up Oper Status : up
Last State Change : 01/24/2017 15:21:05 Socket IfIndex : 595787809

```

```

Configured mode : access Encap Type : raw
Physical Link : yes
EOP Length : 511 Squelch Delay : Disabled
EOP Idle Timeout : 5000 Unsquelch Delay : Disabled
EOP Special Char : Disabled Inter-Session Delay : 10
Squelch Status : off
=====

Socket Statistics
=====
Count

Characters received 4088
Characters transmitted 4088
End of packet idle timeout 0
End of packet length 8
End of packet special character 0
Ingress forwarded packets 8
Egress forwarded packets 8
Ingress dropped packets 0
Egress dropped packets 0
Squelch activated 0
=====

Traffic Statistics
=====
Input Output

Octets 4088 4088
Packets 8 8
Errors 0 0
=====

Port Statistics
=====
Input Output

Packets 8 8
Discards 0 0
Unknown Proto Discards 0
=====

```

**Table 74** Show Port Serial Channel Output Fields

| Label                          | Description                                                                  |
|--------------------------------|------------------------------------------------------------------------------|
| <b>Serial RS-232 Interface</b> |                                                                              |
| Description                    | The description of the port                                                  |
| Interface                      | The port ID displayed in the <i>slot/mda/port.channel</i> format             |
| Type                           | The type of serial interface                                                 |
| Admin Status                   | up: the administrative state is up<br>down: the administrative state is down |

**Table 74 Show Port Serial Channel Output Fields (Continued)**

| Label            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Oper Status      | up: the operational state is up<br>down: the operational state is down                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Physical Link    | yes: a physical link is present<br>no: a physical link is not present                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Clock Source     | The source of the transmit clock:<br>slave: the source is remote                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Device Mode      | The operational mode of the device:<br>synchronous: the device transmits data continuously based on timing<br>asynchronous: the device transmits data one character at a time; applies to RS-232 and X.21 interfaces only and is only applicable for subrate speeds of 38 400 b/s or less                                                                                                                                                                                                                                           |
| Speed            | The speed of the interface:<br>The values for RS-232 and X.21 interfaces, in b/s, are: 600, 1200, 2400, 4800, 9600, 19 200, 38 400, 56 000, 57 600, 115 200. The 600 b/s value is supported on RS-232 interfaces only. The 56 000 b/s value is not supported on RS-232 raw sockets. The 57 600 b/s and 115 200 b/s values are supported on RS-232 raw sockets only.<br>The values for V.35 and X.21 interfaces, in kb/s, are: 64k, 128k, 256k, 384k, 512k, 640k, 768k, 896k, 1024k, 1152k, 1280k, 1408k, 1536k, 1664k, 1792k, 1920k |
| Character Length | The number of data bits used to transmit a character; for asynchronous devices only                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Parity           | The parity bit in a character; for asynchronous devices only                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Stop Bits        | The number of stop bits used signify the end of a character; for asynchronous devices only                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Multi-Drop       | The MDDb mode (RS-232 and X.21 interfaces only):<br>disabled: MDDb mode is off<br>slave: device operates as an MDDb slave device<br>master: device operates as an MDDb master device                                                                                                                                                                                                                                                                                                                                                |

**Table 74 Show Port Serial Channel Output Fields (Continued)**

| Label                                                                                 | Description                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Device Gender                                                                         | The gender of the device:<br>dce: the device is performing the role of the data communications equipment<br>dte: the device is performing the role of the data terminal equipment                                                                                                                                                                                        |
| Duplex                                                                                | The duplex mode:<br>half: single transmission path (supported only if multidrop data bridge is enabled in slave mode)<br>full: two independent transmission paths, one in each direction                                                                                                                                                                                 |
| Data Position                                                                         | The HCM data start position; applies to RS-232 and X.21 interfaces only                                                                                                                                                                                                                                                                                                  |
| S-Bit-Signaling                                                                       | Indicates whether S-bit signaling is turned on or off; applies to RS-232 and X.21 interfaces only                                                                                                                                                                                                                                                                        |
| Last State Change                                                                     | The last time the operational status of the port changed state                                                                                                                                                                                                                                                                                                           |
| Channel IfIndex                                                                       | The channel group index number                                                                                                                                                                                                                                                                                                                                           |
| Loopback                                                                              | The loopback mode for the port or channel:<br>bidir-b: bidirectional loopback B takes place on the control card (CSM) side of the adapter card, and is closer to the system<br>bidir-e: bidirectional loopback E takes place on the data device side of the adapter card, and is closer to the line<br>none: there is no loopback done at the associated port or channel |
| Hold time up                                                                          | The hold-timer value for link-up event dampening                                                                                                                                                                                                                                                                                                                         |
| Hold time down                                                                        | The hold-timer value for link-down event dampening                                                                                                                                                                                                                                                                                                                       |
| Cfg Alarm                                                                             | The HCM alarms to be reported for RS-232 or X.21 interfaces:<br>hcmOof: local HCM out-of-frame errors are raised and cleared<br>hcmRai: HCM remote alarm indication events are raised and cleared                                                                                                                                                                        |
| Alarm Status                                                                          | The current alarm status                                                                                                                                                                                                                                                                                                                                                 |
| <b>Serial Control Leads</b> (The input and output leads, which carry control signals) |                                                                                                                                                                                                                                                                                                                                                                          |

**Table 74 Show Port Serial Channel Output Fields (Continued)**

| Label   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Inputs  | The input control leads                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| dtr-dsr | The Data Terminal Ready/Data Set Ready input control lead (applicable only for RS-232 and V.35 interfaces)                                                                                                                                                                                                                                                                                                                                                                                                             |
| rts-dcd | The Request To Send/Data Carrier Detect input control lead (applicable only for RS-232 and V.35 interfaces)                                                                                                                                                                                                                                                                                                                                                                                                            |
| alb-cts | The Analog Loopback/Clear To Send input control lead (applicable only for RS-232 and V.35 interfaces)<br>Not supported on the 4-port T1/E1 and RS-232 Combination module                                                                                                                                                                                                                                                                                                                                               |
| rdl-ri  | The Remote Digital Loopback/Ring Indicator input control lead (applicable only for RS-232 interfaces)<br>Not supported on the 4-port T1/E1 and RS-232 Combination module                                                                                                                                                                                                                                                                                                                                               |
| c-i     | The Control/Indication input control lead (applicable only for X.21 interfaces)                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Cfg     | The configuration of the input signaling leads: <ul style="list-style-type: none"> <li>• high: the input control lead is assumed to be on</li> <li>• low: the input control lead is assumed to be off</li> <li>• end-to-end: the input control lead follows that of the remote end. It can only be configured when the interface speed is &lt;64 kb/s and is only applicable on the following control leads: <ul style="list-style-type: none"> <li>– rts-dcd</li> <li>– alb-cts</li> <li>– c-i</li> </ul> </li> </ul> |
| Outputs | The output control leads                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| dsr-dtr | The Data Set Ready/Data Terminal Ready output control lead (applicable only for RS-232 and V.35 interfaces)<br>Not supported on the 4-port T1/E1 and RS-232 Combination module                                                                                                                                                                                                                                                                                                                                         |
| dcd-rts | The Data Carrier Detect/Request To Send output control lead (applicable only for RS-232 and V.35 interfaces)                                                                                                                                                                                                                                                                                                                                                                                                           |
| cts-alb | The Clear To Send/Analog LoopBack output control lead (applicable only for RS-232 and V.35 interfaces)                                                                                                                                                                                                                                                                                                                                                                                                                 |
| ri-rdl  | The Ring Indicator/Remote Digital Loopback output control lead (applicable only for RS-232 interfaces)                                                                                                                                                                                                                                                                                                                                                                                                                 |

**Table 74 Show Port Serial Channel Output Fields (Continued)**

| Label | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| i-c   | The Indication/Control output control lead (applicable only for X.21 interfaces)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Cfg   | <p>The configuration of the output signaling leads:</p> <ul style="list-style-type: none"> <li>• high: the output control lead is forced on</li> <li>• low: the output control lead is forced off</li> <li>• end-to-end: the input control lead follows that of the remote end. It can only be configured when the interface speed is &lt;64 kb/s and is only applicable on the following control leads: <ul style="list-style-type: none"> <li>– dcd-rtx</li> <li>– cts-alb – follows that of the remote end except when the output control lead is carrying a CTS signal on an RS-232 port operating at subrate speeds. In this case, the control lead follows the HCM status: <ul style="list-style-type: none"> <li>• if the HCM status is Up, the CTS output control lead is 1</li> <li>• if the HCM status is Down, the CTS output control lead is 0</li> </ul> </li> <li>– i-c</li> </ul> </li> </ul> |
| Netw  | <p>The value that indicates the current states of the input and output control leads. These values are transported over the network; therefore, are referred to as network-side values:</p> <ul style="list-style-type: none"> <li>• 0 indicates low</li> <li>• 1 indicates high</li> <li>• blank indicates unknown (for example, due to a shutdown)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Line  | <p>The value that indicates the current signal levels of the input and output control leads connected to the attached CPE. These values are signaled over the (physical) line; therefore, are referred to as line-side values:</p> <ul style="list-style-type: none"> <li>• 0 indicates low</li> <li>• 1 indicates high</li> <li>• blank indicates unknown (for example, due to a shutdown)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Mon   | Indicates whether monitoring is enabled (on) or disabled (off) for the control lead; applies to input control leads only                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

**Table 74 Show Port Serial Channel Output Fields (Continued)**

| Label                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Traffic Statistics</b>           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Octets Input/Output                 | The total number of octets received and transmitted on the port                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Packets Input/Output                | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                                                                                                         |
| Errors Input/Output                 | <p>For packet-oriented interfaces, the number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol. For character-oriented or fixed-length interfaces, the number of inbound transmission units that contained errors preventing them from being deliverable to a higher-layer protocol.</p> <p>For packet-oriented interfaces, the number of outbound packets that could not be transmitted because of errors. For character-oriented or fixed-length interfaces, the number of outbound transmission units that could not be transmitted because of errors.</p> |
| <b>Port Statistics</b>              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Packets Input/Output                | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                                                                                                         |
| Discards Input/Output               | The number of inbound/outbound packets chosen to be discarded to possibly free up buffer space                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Unknown Proto Discards Input/Output | For packet-oriented interfaces, the number of packets received at the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received at the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0.                                                                                                                                                    |

**Table 74 Show Port Serial Channel Output Fields (Continued)**

| Label                      | Description                                                                                                                                         |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Serial Socket</b>       |                                                                                                                                                     |
| Description                | The configured port type                                                                                                                            |
| Interface                  | The interface ID displayed in the format <i>slot/mda/port.channel</i>                                                                               |
| Admin Status               | The administrative status of the port, either up or down                                                                                            |
| Oper status                | The operational status of the port, either up or down                                                                                               |
| Last State Change          | The last time the operational status of the channel changed state                                                                                   |
| Socket IfIndex             | The socket index number                                                                                                                             |
| Configured mode            | The port mode (serial raw sockets support access mode only)                                                                                         |
| Encap Type                 | The encapsulation type of the port (serial raw sockets support encapsulation type raw only)                                                         |
| Physical Link              | Indicates whether a physical link is present                                                                                                        |
| EOP Length                 | The number of characters (in bytes) that trigger sending an IP transport packet when end of packet is declared                                      |
| Squelch Delay              | Indicates whether squelch delay is enabled or disabled                                                                                              |
| EOP Idle Timeout           | The limit, in milliseconds, that a queued packet can remain idle before an end of packet is declare                                                 |
| Unsquelch Delay            | Indicates whether unsquelch delay is enabled or disabled                                                                                            |
| EOP Special Char           | Indicates whether the sending of a special character that declares end of packet is enabled or disabled                                             |
| Inter-Session Delay        | The time delay, in milliseconds, between transmission of a session's data over a serial port and the transmission of the next queued session's data |
| Squelch Status             | Indicates whether squelch is enabled (on) or disabled (off)                                                                                         |
| <b>Socket Statistics</b>   |                                                                                                                                                     |
| Characters received        | The number of data characters received                                                                                                              |
| Characters transmitted     | The number of data characters sent                                                                                                                  |
| End of packet idle timeout | The number of times that end of packet has been declared due to an EOP idle timeout                                                                 |



**Table 74 Show Port Serial Channel Output Fields (Continued)**

| Label                           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| End of packet length            | The number of times that an IP transport packet was sent due to the EOP packet length being exceeded                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| End of packet special character | The number of times that end of packet has been declared due to an EOP special character being sent                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Ingress forwarded packets       | The number of ingress forwarded packets                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Egress forwarded packets        | The number of egress forwarded packets                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Ingress dropped packets         | The number of ingress dropped packets                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Egress dropped packets          | The number of egress dropped packets                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Squelch activated               | The number of times that squelch was activated                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Traffic Statistics</b>       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Octets Input/Output             | The total number of octets received and transmitted on the port                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Packets Input/Output            | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                                                                                                         |
| Errors Input/Output             | <p>For packet-oriented interfaces, the number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol. For character-oriented or fixed-length interfaces, the number of inbound transmission units that contained errors preventing them from being deliverable to a higher-layer protocol.</p> <p>For packet-oriented interfaces, the number of outbound packets that could not be transmitted because of errors. For character-oriented or fixed-length interfaces, the number of outbound transmission units that could not be transmitted because of errors.</p> |

**Table 74 Show Port Serial Channel Output Fields (Continued)**

| Label                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Port Statistics</b>              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Packets Input/Output                | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent.                                                                                      |
| Discards Input/Output               | The number of inbound/outbound packets chosen to be discarded to possibly free up buffer space                                                                                                                                                                                                                                                                                                                                                                       |
| Unknown Proto Discards Input/Output | For packet-oriented interfaces, the number of packets received at the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received at the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0. |

**Output Example**

```

*A:ALU-1># show port 1/1/1.em detail
=====
Voice Interface
=====
Description : EM
Interface : 1/1/1.em
Type : em
Admin Status : up Oper Status : up
Physical Link : yes Clock Source : node-timed
Signaling Mode : em Signal Mode : cas
Fault Signaling : idle
Idle Code : 13 (0b1101) Seized Code : 5 (0b0101)
Last State Change : 01/08/2010 14:23:28 Channel IfIndex : 578846721
Loopback : none
=====
Voice E&M Signaling Leads
=====
Inputs Cfg Scans Outputs Cfg Drives

m : end-to-end 0 e : end-to-end 0
=====
Voice Signalling Bits
=====
 Rx Tx
DS0 ABCD ABCD

1 1101 1101
=====
Voice Call Usage Statistics (state: idle)
=====
 Accumulated

I/C Call Count 0
I/C Call Count, Ans 0
I/C Call Time 0
I/C Call Time, Ans 0
O/G Call Count 0
O/G Call Count, Ans 0
O/G Call Time 0
O/G Call Time, Ans 0
Out Of Service Time 10
Idle Time 39
Total Call Count 0
Total Call Time 0
=====
Traffic Statistics
=====
 Input Output

Octets 388432 388256
Packets 24277 24266
Errors 0 0
=====

```

```

Port Statistics
=====
 Input Output

Packets 30868 30857
Discards 0 0
Unknown Proto Discards 0
=====

```

**Table 75** Show Port Voice Channel Output Fields

| Label                  | Description                                                                                                 |
|------------------------|-------------------------------------------------------------------------------------------------------------|
| <b>Voice Interface</b> |                                                                                                             |
| Description            | The description of the port                                                                                 |
| Interface              | The port ID displayed in the <i>slot/mda/port.channel</i> format                                            |
| Type                   | The type of voice interface                                                                                 |
| Admin Status           | up: the administrative state is up                                                                          |
|                        | down: the administrative state is down                                                                      |
| Oper Status            | up: the operational state is up                                                                             |
|                        | down: the operational state is down                                                                         |
| Physical Link          | yes: a physical link is present                                                                             |
|                        | no: a physical link is not present                                                                          |
| Clock Source           | node-timed: the link uses the internal clock when transmitting data                                         |
| Signaling Mode         | The signaling mode used by the interface, either em or transmission-only                                    |
| Signal Mode            | The network signaling transport scheme, either cas for em signaling or none for transmission-only signaling |
| Fault Signaling        | The type of fault signaling used by the channel, either idle or seized                                      |
| Idle Code              | The ABCD signaling code to be transmitted when the channel is configured to transmit idle fault signaling   |
| Seized Code            | The ABCD signaling code to be transmitted when the channel is configured to transmit seized fault signaling |
| Last State Change      | The last time the operational status of the channel changed state                                           |
| Channel IfIndex        | The channel index number                                                                                    |

**Table 75 Show Port Voice Channel Output Fields (Continued)**

| Label                                | Description                                                                             |
|--------------------------------------|-----------------------------------------------------------------------------------------|
| Loopback                             | The loopback mode for the channel: internal-analog, internal-digital, or none           |
| <b>Voice E&amp;M Signaling Leads</b> |                                                                                         |
| Inputs                               | The type of input signaling lead (M-lead), shown only if the signaling mode is E&M      |
| Cfg                                  | The configuration of the input signaling lead:                                          |
|                                      | high: (the input signaling lead is assumed on)                                          |
|                                      | low: (the input signaling lead is assumed off)                                          |
|                                      | end-to-end: (the input signaling lead follows that of the remote end)                   |
| Scans                                | The current scanned value of the input lead, which can either be 0 (idle) or 1 (seized) |
| Outputs                              | The type of output lead (E-lead), shown only if the signaling mode is E&M               |
| Cfg                                  | The configuration of the output signaling lead:                                         |
|                                      | high: (the output signaling lead is forced on)                                          |
|                                      | low: (the output signaling lead is forced off)                                          |
|                                      | end-to-end: (the output signaling lead follows that of the remote end)                  |
| Drives                               | The current value set on the output lead, which can either be 0 (idle) or 1 (seized)    |
| <b>Voice Signalling Bits</b>         |                                                                                         |
| DS0                                  | The number of DS0 voice signaling bits                                                  |
| Rx ABCD                              | The signaling bits received from the network side                                       |
| Tx ABCD                              | The signaling bits transmitted to the network side                                      |

**Table 75 Show Port Voice Channel Output Fields (Continued)**

| Label                              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Voice Call Usage Statistics</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                    | <p>The state of the channel (non-forwarding, out-of-service, idle, incoming, or outgoing), and voice call usage statistics</p> <p><b>Note:</b> Non-forwarding means that the channel is in shutdown mode or has no SAP configured; incoming means that the call was received by the channel; outgoing means that the call was originated by the channel</p> <ul style="list-style-type: none"> <li>• Accumulated: the total accumulated statistics since the last time the statistics were cleared</li> <li>• I/C Call Count: the number of incoming calls</li> <li>• I/C Call Count, Ans: the number of incoming calls that were answered</li> <li>• I/C Call Time: the total duration (in seconds) of all incoming calls</li> <li>• I/C Call Time: the total duration (in seconds) of all incoming calls that were answered</li> <li>• I/O/G Call Count: the number of outgoing calls</li> <li>• O/G Call Count: the number of outgoing calls that were answered</li> <li>• O/G Call Time: the total duration (in seconds) of all outgoing calls</li> <li>• O/G Call Time: the total duration (in seconds) of all outgoing calls that were answered</li> <li>• Out-Of-Service Time: the time (in seconds) for which the circuit had alarms raised against the service</li> <li>• Idle Time: the total duration the circuit was in an idle state (that is, on-hook)</li> <li>• Total Call Count: the sum of I/C Call Count and O/G Call Count</li> <li>• Total Call Time: the sum of I/C Call Time and O/G Call Time</li> </ul> <p><b>Note:</b> The only valid statistics for transmission-only mode are Idle Time and Out Of Service Time. When the system is in transmission-only mode and in a forwarding state, there is no signaling. To show that the system is active (that is, not in an out-of-service state) the "Idle Time" counter is incremented. This is a design intent.</p> |

**Table 75 Show Port Voice Channel Output Fields (Continued)**

| Label                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Traffic Statistics</b>           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Packets Input/Output                | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                                                                                                         |
| Errors Input/Output                 | <p>For packet-oriented interfaces, the number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol. For character-oriented or fixed-length interfaces, the number of inbound transmission units that contained errors preventing them from being deliverable to a higher-layer protocol.</p> <p>For packet-oriented interfaces, the number of outbound packets that could not be transmitted because of errors. For character-oriented or fixed-length interfaces, the number of outbound transmission units that could not be transmitted because of errors.</p> |
| <b>Port Statistics</b>              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Packets Input/Output                | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                                                                                                         |
| Discards Input/Output               | The number of inbound/outbound packets chosen to be discarded to possibly free up buffer space                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Unknown Proto Discards Input/Output | For packet-oriented interfaces, the number of packets received at the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received at the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0.                                                                                                                                                    |

**Output Example**

```

*A:ALU-1># show port 1/4/1.5
=====
TDM DS0 Chan Group
=====
Description : DS0GRP
Interface : 1/4/1.5
TimeSlots :
Speed : 64 CRC : 16
Admin Status : down Oper Status : down
BER SF Link Down : disabled
Last State Change : 06/22/2009 12:29:42 Chan-Grp IfIndex : 578846785
Configured mode : access Encap Type : atm
Admin MTU : 1524 Oper MTU : 1524
Scramble : true
Physical Link : Yes Bundle Number : none
Idle Cycle Flags : n/a Load-balance-algo : n/a
Payload Fill Type : n/a Payload Pattern : n/a
Signal Fill Type : n/a Signal Pattern : n/a
Ing. Pool % Rate : 100 Egr. Pool % Rate : 100
Egr. Sched. Pol : n/a
=====
Traffic Statistics
=====
 Input Output

Octets 0 0
Packets 0 0
Errors 0 0
=====
Port Statistics
=====
 Input Output

Packets 0 0
Discards 0 0
Unknown Proto Discards 0
=====
*A:ALU-1#
*A:ALU-1># show port 1/1/2.1
=====
Serial DS0 Chan Group
=====
Description : DS0GRP
Interface : 1/1/2.1
TimeSlots : 1
Admin Status : down Oper Status : down
Last State Change : 06/28/2009 15:32:14 Chan-Grp IfIndex : 572588095
Configured Mode : access Encap Type : cem
Admin MTU : 1514 Oper MTU : 1514
Physical Link : No Bundle Number : none
Idle Cycle Flags : n/a
Payload Fill Type : all-ones Payload Pattern : n/a
=====

```



```

=====
Traffic Statistics
=====
 Input Output

Octets 0 0
Packets 0 0
Errors 0 0
=====
Port Statistics
=====
 Input Output

Packets 0 0
Discards 0 0
Unknown Proto Discards 0
=====
*A:ALU-1#
*A:ALU-1># show port 1/1/1.1
=====
Voice DS0 Chan Group
=====
Description : DS0GRP
Interface : 1/1/1.1
Admin Status : up Oper Status : up
Last State Change : 01/08/2010 14:23:29 Chan-Grp IfIndex : 578846781
Configured Mode : access Encap Type : cem
Admin MTU : 1514 Oper MTU : 1514
Physical Link : Yes
=====
Traffic Statistics
=====
 Input Output

Octets 611744 611584
Packets 38234 38224
Errors 0 0
=====
Port Statistics
=====
 Input Output

Packets 38234 38224
Discards 0 0
Unknown Proto Discards 0
=====
*A:ALU-1#
A:ALU-1# show port 1/2/2.1.1
=====
TDM DS1 Interface
=====
Description : DS1
Interface : 1/2/2.1.1
Type : ds1 Framing : esf
Admin Status : up Oper Status : down
Physical Link : no Clock Source : node-timed
Last State Change : 01/26/2009 15:35:50 Channel IfIndex : 574685991

```

```

Loopback : none
Remote Loop respond: false
Load-balance-algo : default
Cfg Alarm : ais los
Alarm Status :
Hold time up : 0 milliseconds
Hold time down : 0 milliseconds
=====

=====
Traffic Statistics
=====
 Input Output

Octets 0 0
Packets 0 0
Errors 0 0
=====

Port Statistics
=====
 Input Output

Packets 0 0
Discards 0 0
Unknown Proto Discards 0
=====

```

**Table 76** Show Port Channel Group Output Fields

| Label               | Description                                                                 |
|---------------------|-----------------------------------------------------------------------------|
| Description         | A text description of the port                                              |
| Interface           | The port ID displayed in the format <i>slot/mda/port.channel-group-id</i>   |
| Timeslots           | The number of timeslots that are part of this channel group                 |
| Speed               | The speed of the interface                                                  |
| CRC                 | The checksum used for the channel group (16 or 32)                          |
| Admin Status        | Up: the port is administratively up                                         |
|                     | Down: the port is administratively down                                     |
| BER SF Link Down    | Indicates whether BER SF Link Down is enabled                               |
| Oper Status         | Up: the port is operationally up                                            |
|                     | Down: the port is operationally down                                        |
| Remote Loop respond | Indicates whether the channel will respond to requests for remote loopbacks |

**Table 76 Show Port Channel Group Output Fields (Continued)**

| Label             | Description                                                                                                                                                               |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cfg Alarm         | Indicates the alarms configured                                                                                                                                           |
| Last State Change | The last time the operational status of the port changed state                                                                                                            |
| Chan Grp IfIndex  | The channel group index number                                                                                                                                            |
| Channel IfIndex   | The channel interface index number                                                                                                                                        |
| Configured Mode   | network: the port is configured for transport network use                                                                                                                 |
|                   | access: the port is configured for service access                                                                                                                         |
| Encap Type        | The encapsulation type for the channel group (atm, cem, ipcp, ppp-auto, hdlc, or cisco-hdlc)                                                                              |
| Admin MTU         | The configured MTU                                                                                                                                                        |
| Oper MTU          | The negotiated size of the largest packet that can be sent on the port or channel specified in octets                                                                     |
| Scramble          | Indicates whether payload scrambling is enabled on channel groups (only applicable if encap type is atm)                                                                  |
| Hold time up      | The hold-timer value for link-up event dampening                                                                                                                          |
| Hold time down    | The hold-timer value for link-down event dampening                                                                                                                        |
| Physical Link     | Yes: a physical link is present                                                                                                                                           |
|                   | No: a physical link is not present                                                                                                                                        |
| Bundle Number     | The number assigned to the multilink bundle                                                                                                                               |
| Idle Cycle Flags  | The value transmitted by the DS0, DS1, or E1 interface during idle cycles                                                                                                 |
| Clock Source      | loop-timed: the link recovers the clock from the received data stream                                                                                                     |
|                   | node-timed: the link uses the internal clock when transmitting data                                                                                                       |
|                   | adaptive: clocking is derived from the incoming pseudowire packets                                                                                                        |
| Payload Fill Type | The payload type to be transmitted when the circuit emulation service is not operational or temporarily experiences underrun conditions (only valid for CESoPSN services) |
| Payload Pattern   | The user-defined pattern transmitted if the payload fill type is pattern                                                                                                  |

**Table 76 Show Port Channel Group Output Fields (Continued)**

| Label                     | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Signal Fill Type          | The signaling type to be transmitted when the circuit emulation service is not operational or temporarily experiences underrun conditions (only valid for CESoPSN with CAS)                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Signal Pattern            | The user-defined pattern transmitted if the payload fill type is pattern                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Traffic Statistics</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Octets Input/Output       | The total number of octets received and transmitted on the port                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Packets Input/Output      | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                                                                                                         |
| Errors Input/Output       | <p>For packet-oriented interfaces, the number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol. For character-oriented or fixed-length interfaces, the number of inbound transmission units that contained errors preventing them from being deliverable to a higher-layer protocol.</p> <p>For packet-oriented interfaces, the number of outbound packets that could not be transmitted because of errors. For character-oriented or fixed-length interfaces, the number of outbound transmission units that could not be transmitted because of errors.</p> |
| <b>Port Statistics</b>    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Packets Input/Output      | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                                                                                                         |
| Discards Input/Output     | The number of inbound/outbound packets chosen to be discarded to possibly free up buffer space                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

**Table 76 Show Port Channel Group Output Fields (Continued)**

| Label                                  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Unknown proto discards<br>Input/Output | For packet-oriented interfaces, the number of packets received via the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received via the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0. For ATM, this field displays cells discarded on an invalid vpi/vci. Unknown proto discards do not show up in the packet counts. |

**Output Example**

A:ALU-1# show port 1/4/1.ds3

```

=====
TDM Interface
=====
Description : DS3
Interface : 1/4/1.ds3
Type : ds3
Admin Status : up
Physical Link : No
Last State Change : 10/02/2009 19:21:59
Configured mode : access
Admin MTU : 1524
Scramble : true
Ing. Pool % Rate : 100
Egr. Sched. Pol : N/A
CRC : 32
Idle Cycle Flags : n/a
FEAC Loop Respond : Disabled
BERT Duration : N/A
BERT Synched : 00h00m00s
BERT Errors : 0
BERT Total Bits : N/A
Cfg Alarm : ais los
Alarm Status :
Subrate CSU Mode : none
MDL Transmit : none
Framing : m23
Oper Status : up
Clock Source : node-timed
Port IfIndex : 578846721
Encap Type : atm
Oper MTU : 1524
Egr. Pool % Rate : 100
Channelized : DS1
Loopback : line
In FEAC Loop : No
BERT Pattern : none
Err Insertion Rate : 0
BERT Status : idle
Subrate Step : 0

Local MDL Information

EIC : LIC :
FIC : Unit :
PFI :
Idle Signal Port :
Test Signal Gen :

```

```

Far End MDL Information

EIC : LIC :
FIC : Unit :
PFI :
Idle Signal Port :
Test Signal Gen :
=====
Traffic Statistics
=====
 Input Output

Octets 0 0
Packets 0 0
Errors 0 0
=====
Port Statistics
=====
 Input Output

Packets 0 0
Discards 0 0
Unknown Proto Discards 0
=====

```

**Table 77** Show Port Channelized DS3 Output Fields

| Label             | Description                                                               |
|-------------------|---------------------------------------------------------------------------|
| Description       | A text description of the port                                            |
| Interface         | The port ID displayed in the format <i>slot/mda/port.channel-group-id</i> |
| Type              | The type of interface                                                     |
| Timeslots         | The number of timeslots that are part of this channel group               |
| Speed             | The speed of the interface                                                |
| CRC               | The checksum used for the channel group (16 or 32)                        |
| Admin Status      | Up: the port is administratively up                                       |
|                   | Down: the port is administratively down                                   |
| Oper Status       | Up: the port is operationally up                                          |
|                   | Down: the port is operationally down                                      |
| Last State Change | The last time the operational status of the port changed state            |
| Chan Grp IfIndex  | The channel group index number                                            |

**Table 77 Show Port Channelized DS3 Output Fields (Continued)**

| Label             | Description                                                                                                                                                                                                             |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Configured Mode   | network: the port is configured for transport network use                                                                                                                                                               |
|                   | access: the port is configured for service access                                                                                                                                                                       |
| Encap Type        | The encapsulation type for the channel group (atm, cem, ipcp, ppp-auto)                                                                                                                                                 |
| Admin MTU         | The configured MTU                                                                                                                                                                                                      |
| Oper MTU          | The negotiated size of the largest packet that can be sent on the port or channel specified in octets                                                                                                                   |
| Scramble          | Indicates whether payload scrambling is enabled on channel groups (only applicable if encap type is atm)                                                                                                                |
| CRC               | Indicates the precision of the cyclic redundancy check:<br>16 — a 16-bit CRC calculation<br>32 — a 32-bit CRC calculation; 32-bit CRC increases the error detection ability, but it also adds some performance overhead |
| Physical Link     | Yes: a physical link is present                                                                                                                                                                                         |
|                   | No: a physical link is not present                                                                                                                                                                                      |
| Idle Cycle Flags  | The value transmitted by the DS0, DS1, or E1 interface during idle cycles                                                                                                                                               |
| FEAC Loop Respond | Indicates whether the associated DS3 interface can respond to remote loop signals                                                                                                                                       |
| Cfg Alarm         | The alarms that have alarm reporting enabled                                                                                                                                                                            |
| Alarm Status      | The current alarm state (for example, stray, malformed, packet loss, overrun, underrun, remote packet loss, remote fault, or remote RDI)                                                                                |
| Framing           | The DS3 framing mode                                                                                                                                                                                                    |
| Clock Source      | loop-timed: the link recovers the clock from the received data stream<br>node-timed: the link uses the internal clock when transmitting data<br>adaptive: clocking is derived from the incoming pseudowire packets      |
| Port IfIndex      | The interface's index number, which reflects its initialization sequence                                                                                                                                                |

**Table 77 Show Port Channelized DS3 Output Fields (Continued)**

| Label                     | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| oper MTU                  | The negotiated size of the largest packet that can be sent on the port or channel specified in octets                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Channelized               | The level of channelization on the port                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Loopback                  | The port loopback mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| In FEAC Loop              | The remote loopback state                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Local MDL Information     | The MDL strings sent by the near end                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Far End MDL Information   | The MDL strings received from the far end                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Traffic Statistics</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Octets Input/Output       | The total number of octets received and transmitted on the port                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Packets Input/Output      | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                                                                                                         |
| Errors Input/Output       | <p>For packet-oriented interfaces, the number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol. For character-oriented or fixed-length interfaces, the number of inbound transmission units that contained errors preventing them from being deliverable to a higher-layer protocol.</p> <p>For packet-oriented interfaces, the number of outbound packets that could not be transmitted because of errors. For character-oriented or fixed-length interfaces, the number of outbound transmission units that could not be transmitted because of errors.</p> |



**Table 77 Show Port Channelized DS3 Output Fields (Continued)**

| Label                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Port Statistics</b>              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Packets Input/Output                | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                                                                                        |
| Discards Input/Output               | The number of inbound/outbound packets chosen to be discarded to possibly free up buffer space                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Unknown proto discards Input/Output | For packet-oriented interfaces, the number of packets received via the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received via the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0. For ATM, this field displays cells discarded on an invalid vpi/vci. Unknown proto discards do not show up in the packet counts. |

**Output Example**

```

A:ALU-1# show port 1/4/1
=====
TDM DS3 Physical Interface
=====
Description : DS3/E3
Interface : 1/4/1 Port IfIndex : 41975808
Admin Status : down Oper Status : down
Physical Link : No
Type : ds3 Buildout : short
Hardware Address : 00:25:ba:33:31:73
=====
Port Statistics
=====
 Input Output

Packets 0 0
Discards 0 0
Unknown Proto Discards 0
=====

```

**Table 78 Show Port Clear Channel DS3 Output Fields**

| Label                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Description                         | A text description of the port                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Interface                           | The port ID displayed in the format <i>slot/mda/port</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Port IfIndex                        | The interface's index number, which reflects its initialization sequence                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Admin Status                        | Up: the port is administratively up                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                     | Down: the port is administratively down                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Oper Status                         | Up: the port is operationally up                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                     | Down: the port is operationally down                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Physical Link                       | Yes: a physical link is present                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                     | No: a physical link is not present                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Type                                | The type of interface                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Buildout                            | The line buildout (cable length) for the DS3 physical interface                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Hardware Address                    | The port's hardware address                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Port Statistics</b>              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Packets Input/Output                | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                                                                                        |
| Discards Input/Output               | The number of inbound/outbound packets chosen to be discarded to possibly free up buffer space                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Unknown proto discards Input/Output | For packet-oriented interfaces, the number of packets received via the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received via the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0. For ATM, this field displays cells discarded on an invalid vpi/vci. Unknown proto discards do not show up in the packet counts. |

**Output Example**

```

*A:ALU-1># show port 1/4/1.e1 acr detail
=====
Adaptive Clock Recovery (ACR) Configuration
=====
Clock Master PW : 1/4/1.1
Clock Sync State : normal

CEM SAP Configuration Information

Endpoint Type : NxDS0 Bit-rate : 16
Payload Size : 32 Jitter Buffer : 5
Use RTP Header : No Differential : No
Timestamp Freq : 0 CAS Framing : No CAS
Effective PDVT : +/-2.500 ms

Cfg Alarm : stray malformed pktloss overrun underrun
Alarm Status :

CEM SAP Statistics

```

|                      | Packets    | Seconds | Events |
|----------------------|------------|---------|--------|
| <b>Egress Stats</b>  |            |         |        |
| Forwarded            | : 32993106 |         |        |
| Dropped              | : 0        |         |        |
| Missing              | : 0        |         |        |
| Reordered Forwarded  | : 0        |         |        |
| Underrun             | : 8058     |         | 0      |
| Overrun              | : 0        |         | 0      |
| Misordered Dropped   | : 0        |         |        |
| Malformed Dropped    | : 0        |         |        |
| LBit Dropped         | : 0        |         |        |
| Error                | :          | 3       |        |
| Severely Error       | :          | 2       |        |
| Unavailable          | :          | 0       |        |
| Failure Count        | :          |         | 1      |
| Jitter Buffer Depth  | : 0        |         |        |
| <b>Ingress Stats</b> |            |         |        |
| Forwarded            | : 32995595 |         |        |
| Dropped              | : 0        |         |        |

```

=====
Adaptive Clock Recovery (ACR)
- Internal Digital Phase Locked Loop (DPLL) Statistics
=====

```

| time                | frequency<br>offset<br>mean<br>(ppb) | frequency<br>offset<br>stddev<br>(ppb) | phase<br>error<br>mean<br>(ns) | phase<br>error<br>stddev<br>(ns) |
|---------------------|--------------------------------------|----------------------------------------|--------------------------------|----------------------------------|
| 10/08/2008 11:27:11 | 220                                  | 1                                      | 273                            | 94                               |
| 10/08/2008 11:26:11 | 217                                  | 1                                      | 240                            | 120                              |
| 10/08/2008 11:25:11 | 214                                  | 1                                      | 79                             | 157                              |
| 10/08/2008 11:24:11 | 214                                  | 1                                      | -15                            | 102                              |
| 10/08/2008 11:23:11 | 214                                  | 1                                      | 82                             | 117                              |
| 10/08/2008 11:22:11 | 213                                  | 1                                      | 12                             | 113                              |
| 10/08/2008 11:21:11 | 213                                  | 1                                      | -64                            | 119                              |
| 10/08/2008 11:20:11 | 213                                  | 1                                      | -66                            | 126                              |

```

10/08/2008 11:19:11 214 1 -41 117
10/08/2008 11:18:11 215 1 72 125
10/08/2008 11:17:11 214 1 -34 95
10/08/2008 11:16:11 214 1 -28 115
10/08/2008 11:15:11 215 1 30 89
10/08/2008 11:14:11 214 1 12 95
10/08/2008 11:13:11 214 1 19 144

Current
24 Hour
(137 min) 214 19
=====

=====
ACR State Statistics
=====
Algorithm State Counts
normal : 4121
Phase-tracking : 3
Freq-tracking : 0
Holdover : 0
Free-run : 8
Events
ACR Calc Out of Range : 0
Prolonged ACR Failure : 1
Excessive Packet Loss : 0
Excessive Phase Shift : 0
=====

```

**Table 79**      **Show Port ACR Detail Output Fields**

| Label                                              | Description                                                                                     |
|----------------------------------------------------|-------------------------------------------------------------------------------------------------|
| <b>Adaptive Clock Recovery (ACR) Configuration</b> |                                                                                                 |
| Clock Master PW                                    | The SAP being used by the port for recovering the clock                                         |
| Clock Sync State                                   | The current state of the ACR adaptive algorithm                                                 |
| <b>CEM SAP Configuration Information</b>           |                                                                                                 |
| Endpoint Type                                      | The type of endpoint                                                                            |
| Bit-rate                                           | The number of DS0s or timeslots in the channel group                                            |
| Payload Size                                       | The number of octets contained in the payload of a TDM PW packet when the packet is transmitted |
| Jitter Buffer                                      | The size of the receive jitter buffer, expressed in milliseconds                                |
| Use RTP Header                                     | Indicates whether RTP headers are used in CES packets (Yes or No)                               |
| CAS Framing                                        | The type of CAS framing                                                                         |

**Table 79 Show Port ACR Detail Output Fields (Continued)**

| Label                                                       | Description                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Effective PDVT                                              | The peak-to-peak packet delay variation (PDV) used by the circuit emulation service<br>Since the operating system may adjust the jitter buffer setting in order to ensure no packet loss, the configured jitter buffer value may not be the value used by the system. The effective PDVT provides an indication that the PDV has been adjusted by the operating system. |
| Cfg Alarm                                                   | The alarms that have alarm reporting enabled                                                                                                                                                                                                                                                                                                                            |
| Alarm Status                                                | The current alarm state (for example, stray, malformed, packet loss, overrun, underrun, remote packet loss, remote fault, or remote RDI)                                                                                                                                                                                                                                |
| <b>Internal Digital Phase Locked Loop (DPLL) Statistics</b> |                                                                                                                                                                                                                                                                                                                                                                         |
| ACR DPLL Statistics                                         | frequency offset mean: the ACR frequency offset mean for the previous 15 sets of 60-s intervals                                                                                                                                                                                                                                                                         |
|                                                             | frequency offset stddev: the ACR frequency offset standard deviation for the previous 15 sets of 60-s intervals                                                                                                                                                                                                                                                         |
|                                                             | phase error mean: the ACR input phase error mean and output DCO mean for the previous 15 sets of 60-s intervals                                                                                                                                                                                                                                                         |
|                                                             | phase error stddev: the ACR input phase error standard deviation and output DCO standard deviation for the previous 15 sets of 60-s intervals                                                                                                                                                                                                                           |
| <b>ACR State Statistics</b>                                 |                                                                                                                                                                                                                                                                                                                                                                         |
| Algorithm State Counts                                      | normal: the number of 2-s intervals the ACR algorithm was in the normal state                                                                                                                                                                                                                                                                                           |
|                                                             | Phase-tracking: the number of 2-s intervals the ACR algorithm was in the phase-tracking state                                                                                                                                                                                                                                                                           |
|                                                             | Freq-tracking: the number of 2-s intervals the ACR algorithm was in the frequency tracking state                                                                                                                                                                                                                                                                        |
|                                                             | Holdover: the number of 2-s intervals the ACR algorithm was in the holdover state                                                                                                                                                                                                                                                                                       |
|                                                             | Free-run: the number of 2-s intervals the ACR algorithm was in the free-run state                                                                                                                                                                                                                                                                                       |

**Table 79 Show Port ACR Detail Output Fields (Continued)**

| Label  | Description                                                                                                                                                                    |
|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Events | ACR Calc Out of Range: the number of times the ACR algorithm was internally reset                                                                                              |
|        | Prolonged ACR failure: the number of times the ACR algorithm was in the phase-tracking or holdover state for an extended period of time                                        |
|        | Excessive Packet Loss: increments every 2-second interval that ACR is in the phase-tracking state and the tolerated packet loss threshold is exceeded                          |
|        | Excessive Phase Shift: increments each time the ACR algorithm transitions to the phase-tracking state from normal as a result of a phase shift above the tolerated shift level |

**Output Example**

```

*A:ALU-1# show port dot1x 1/5/2 detail
=====
802.1x Port Status
=====
Port control : force-auth
Port status : authorized
Authenticator PAE state : force-auth
Backend state : initialize
Reauth enabled : yes Reauth period : 3500
Max auth requests : 2 Transmit period : 30
Supplicant timeout : 30 Server timeout : 30
Quiet period : 60
Radius-plcy : N/A
=====
802.1x Session Statistics
=====
authentication method : remote-radius
last session id : PAC-02A10000-8A61E689
last session time : 0497d02h
last session username : N/A
last session term cause : N/A
user tx octets : 0 user tx frames : 0
user rx octets : 0 user rx frames : 0
=====
802.1x Authentication Statistics
=====
tx frames : 0 rx frames : 0
tx req/id frames : 0 rx resp/id frames : 0
tx request frames : 0 rx response frames : 0
rx start frames : 0 rx logoff frames : 0
rx unknown frame type : 0 rx bad eap length : 0
rx last version : 0 rx last source mac :
=====
802.1x Authentication Diagnostics

```

```

=====
Enters Connecting : 0
EapLogoffs While Connecting : 0
Success While Authenticating : 0
Timeouts While Authenticating : 0
Failures While Authenticating : 0
Reauths While Authenticating : 0
EapStarts While Authenticating : 0
EapLogoffs While Authenticating : 0
Reauths While Authenticated : 0
EapStarts While Authenticated : 0
EapLogoffs While Authenticated : 0
Backend Responses : 0
Backend Access Challenges : 0
Backend Requests To Supplicant : 0
Backend Non Nak Responses : 0
Backend Auth Successes : 0
Backend Auth Failures : 0
=====
*A:ALU-1>#

```

**Table 80**      **Show Port dot1x Output Fields**

| Label                     | Description                                                                                                                                                                                 |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>802.1x Port Status</b> |                                                                                                                                                                                             |
| Port control              | auto: the 802.1x authentication mode is configured as automatic. The port starts in an unauthorized state and stays in that state until the first supplicant is authenticated successfully. |
|                           | force-auth: 802.1 authentication is disabled and the port is automatically authorized                                                                                                       |
|                           | force-unauth: the port will always remain in the unauthorized state                                                                                                                         |
| Port status               | authorized: the 802.1 port is authorized                                                                                                                                                    |
|                           | unauthorized: the 802.1 port is unauthorized                                                                                                                                                |
| Authenticator PAE state   | auto: the authenticator is set to the unauthorized state                                                                                                                                    |
|                           | force-auth: the authenticator is set to the authorized state                                                                                                                                |
|                           | force-unauth: the authenticator is set to the unauthorized state                                                                                                                            |

**Table 80 Show Port dot1x Output Fields (Continued)**

| Label              | Description                                                                                                                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Backend state      | request: the backend authentication machine is in the request state                                                                                                                                         |
|                    | response: the backend authentication machine is in the response state                                                                                                                                       |
|                    | success: the backend authentication machine is in the success state                                                                                                                                         |
|                    | fail: the backend authentication machine is in the fail state                                                                                                                                               |
|                    | timeout: the backend authentication machine is in the timeout state                                                                                                                                         |
|                    | idle: the backend authentication machine is in the idle state                                                                                                                                               |
|                    | initialize: the backend authentication machine is in the initialize state                                                                                                                                   |
| Reauth enabled     | Indicates whether reauthentication is enabled                                                                                                                                                               |
| Max auth requests  | The maximum number of authentication requests the 7705 SAR sends to the RADIUS server before declaring the port unauthorized                                                                                |
| Supplicant timeout | The number of seconds the 7705 SAR waits for a client to respond to an EAPOL message before considering the 802.1x authentication to have failed                                                            |
| Quiet period       | The period, in seconds, between two authentication sessions during which no EAPOL frames are sent by the 7705 SAR                                                                                           |
| Radius-plcy        | The name of the RADIUS policy used for 802.1x authentication                                                                                                                                                |
| Reauth period      | The delay, in seconds, before the 7705 SAR attempts reauthentication                                                                                                                                        |
| Transmit period    | The time, in seconds, that the 7705 SAR waits before sending a new EAPOL message                                                                                                                            |
| Server timeout     | The time, in seconds, that the 7705 SAR waits for the RADIUS server to respond to the access request message before resending the request message the number of times specified by the max-auth-req command |



**Table 80 Show Port dot1x Output Fields (Continued)**

| Label                            | Description                                                                                                     |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------|
| <b>802.1x Session Statistics</b> |                                                                                                                 |
| authentication method            | remote-radius: the authentication method used to establish the session                                          |
| last session id                  | A unique identifier for the session, in the form of a printable ASCII string of at least three characters       |
| last session time                | The duration of the session in seconds                                                                          |
| last session username            | The username representing the identity of the supplicant PAE                                                    |
| last session term cause          | The reason for the session termination:<br>supplicantLogoff: the supplicant logged off                          |
|                                  | portFailure: there was a port failure                                                                           |
|                                  | supplicantRestart: the supplicant state machine reinitialized                                                   |
|                                  | reauthFailed: the reauthentication attempt failed                                                               |
|                                  | authControlForceUnauth: the authentication mode was changed to always force unauthorized after being authorized |
|                                  | portRelnit: the port was reinitialized                                                                          |
|                                  | portAdminDisabled: the port was administratively disabled                                                       |
|                                  | notTerminatedYet: the session has not been terminated                                                           |
| user tx octets                   | The number of octets transmitted in user data frames on this port during the session                            |
| user rx octets                   | The number of octets received in user data frames on this port during the session                               |
| user tx frames                   | The number of user data frames transmitted on this port during the session                                      |
| user rx frames                   | The number of user data frames received on this port during the session                                         |

**Table 80 Show Port dot1x Output Fields (Continued)**

| Label                                   | Description                                                                                                               |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| <b>802.1x Authentication Statistics</b> |                                                                                                                           |
| tx frames                               | The number of EAPOL frames of any type that have been transmitted by this authenticator                                   |
| tx req/id frames                        | The number of EAP-Request/ID frames that have been transmitted by this authenticator                                      |
| tx request frames                       | The number of EAP request frames (other than Request/ID frames) that have been transmitted by this authenticator          |
| rx start frames                         | The number of EAPOL-Start frames that have been received by this authenticator                                            |
| rx unknown frame type                   | The number of EAPOL frames that have been received by this authenticator in which the frame type is not recognized        |
| rx last version                         | The protocol version number carried in the most recently received EAPOL frame                                             |
| rx frames                               | The number of valid EAPOL frames of any type that have been received by this authenticator                                |
| rx resp/id frames                       | The number of EAP-Response/ID frames that have been received by this authenticator                                        |
| rx response frames                      | The number of valid EAP response frames (other than Resp/ID frames) that have been received by this authenticator         |
| rx logoff frames                        | The number of EAP-Logoff frames that have been received by this authenticator                                             |
| rx bad eap length                       | The number of EAPOL frames that have been received by this authenticator in which the packet body length field is invalid |
| rx last source mac                      | The source MAC address carried in the most recently received EAPOL frame                                                  |

**Table 80 Show Port dot1x Output Fields (Continued)**

| Label                                    | Description                                                                                                                                                                                                                             |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>802.1x Authentication Diagnostics</b> |                                                                                                                                                                                                                                         |
| Enters Connecting                        | Counts the number of times that the state machine transitions to the CONNECTING state from any other state                                                                                                                              |
| EapLogoffs While Connecting              | Counts the number of times that the state machine transitions from CONNECTING to DISCONNECTED as a result of receiving an EAPOL-logoff message                                                                                          |
| Success While Authenticating             | Counts the number of times that the state machine transitions from AUTHENTICATING to AUTHENTICATED, as a result of the backend authentication state machine indicating successful authentication of the supplicant (authSuccess = TRUE) |
| Timeouts While Authenticating            | Counts the number of times that the state machine transitions from AUTHENTICATING to ABORTING, as a result of the backend authentication state machine indicating authentication timeout (authTimeout = TRUE)                           |
| Failures While Authenticating            | Counts the number of times that the state machine transitions from AUTHENTICATING to HELD, as a result of the backend authentication state machine indicating authentication failure (authFail = TRUE)                                  |
| Reauths While Authenticating             | Counts the number of times that the state machine transitions from AUTHENTICATING to ABORTING, as a result of a reauthentication request (reAuthenticate = TRUE)                                                                        |
| EapStarts While Authenticating           | Counts the number of times that the state machine transitions from AUTHENTICATING to ABORTING, as a result of an EAPOL-Start message being received from the supplicant                                                                 |
| EapLogoffs While Authenticating          | Counts the number of times that the state machine transitions from AUTHENTICATING to ABORTING, as a result of an EAPOL-Logoff message being received from the supplicant                                                                |
| Reauths While Authenticated              | Counts the number of times that the state machine transitions from AUTHENTICATED to CONNECTING, as a result of a reauthentication request (reAuthenticate = TRUE)                                                                       |

**Table 80 Show Port dot1x Output Fields (Continued)**

| Label                          | Description                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EapStarts While Authenticated  | Counts the number of times that the state machine transitions from AUTHENTICATED to CONNECTING, as a result of an EAPOL-Start message being received from the supplicant                                                                                                                                                                                                                         |
| EapLogoffs While Authenticated | Counts the number of times that the state machine transitions from AUTHENTICATED to DISCONNECTED, as a result of an EAPOL-Logoff message being received from the supplicant                                                                                                                                                                                                                      |
| Backend Responses              | Counts the number of times that the state machine sends an initial Access-Request packet to the authentication server (that is, executes sendRespToServer on entry to the RESPONSE state)<br>Indicates that the authenticator attempted communication with the authentication server                                                                                                             |
| Backend Access Challenges      | Counts the number of times that the state machine receives an initial Access-Challenge packet from the authentication server (that is, aReq becomes TRUE, causing an exit from the RESPONSE state)<br>Indicates that the authentication server has communication with the authenticator                                                                                                          |
| Backend Requests To Supplicant | Counts the number of times that the state machine sends an EAP-Request packet (other than an Identity, Notification, Failure, or Success message) to the supplicant (that is, executes txReq on entry to the REQUEST state)<br>Indicates that the authenticator chose an EAP-method                                                                                                              |
| Backend Non Nak Responses      | Counts the number of times that the state machine receives a response from the supplicant to an initial EAP-Request, and the response is something other than EAP-NAK (that is, rxResp becomes TRUE, causing the state machine to transition from REQUEST to RESPONSE, and the response is not an EAP-NAK)<br>Indicates that the supplicant can respond to the authenticator's chosen EAP-method |
| Backend Auth Successes         | Counts the number of times that the state machine receives an EAP-Success message from the authentication server (that is, aSuccess becomes TRUE, causing a transition from RESPONSE to SUCCESS)<br>Indicates that the supplicant has successfully authenticated to the authentication server                                                                                                    |

**Table 80 Show Port dot1x Output Fields (Continued)**

| Label                 | Description                                                                                                                                                                                                                                                                    |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Backend Auth Failures | Counts the number of times that the state machine receives an EAP-Failure message from the authentication server (that is, aFail becomes TRUE, causing a transition from RESPONSE to FAIL)<br>Indicates that the supplicant has not authenticated to the authentication server |

**Output Example**

```
*A:ALU-1># show port 1/4/1 description
=====
Port Descriptions on Slot 1
=====
Port Id Description

1/4/1 DS3/E3
=====
*A:ALU-1>
```

**Table 81 Show Port Description Output Fields**

| Label       | Description                    |
|-------------|--------------------------------|
| Port Id     | The port identifier            |
| Description | A text description of the port |

**Output Example**

```
*A:ALU-1># show port 1/5/1 associations
=====
Interface Table
=====
Router/ServiceId Name Encap Val

Router: Base if1000 1000
Router: Base if2000 2000

Interfaces
=====
*A:ALU-1>
```

**Table 82 Show Port Associations Output Fields**

| Label            | Description                                                                    |
|------------------|--------------------------------------------------------------------------------|
| Router/ServiceId | The service identifier                                                         |
| Name             | The name of the IP interface                                                   |
| Encap Val        | The dot1q, null, or qinq encapsulation value on the port for this IP interface |

**Output Example**

```
*A:ALU-1># show port 1/2/1.1 ima-link
=====
State Information
=====
Transmit Link Identifier: 0
Receive Link Identifier : 0
Near Rx Failure State : IMA Link Failure
Far End Rx Failure State: IMA Link Failure
Near End Tx State : Unusable - No given reason
Near End Rx State : Unusable - No given reason
Far End Tx State : Unusable - No given reason
Far End Rx State : Unusable - No given reason
Link Test State : Disabled
Rx Test Pattern : 0
=====
TC Sublayer Information
=====
TC Alarm State : LCD Failure Number OCD Events : 0
HEC Errors (Dropped) : 0 HEC Errors (Fixed) : 0
=====
Statistical Information
=====
Num Violations : 0 Num OIF Anomalies : 0
NE Severely Err. Seconds: 0 FE Severely Err. Seconds: 0
NE Unavail. Seconds : 0 FE Unavail. Seconds : 0
NE Tx Unused Seconds : 0 FE Tx Unused Seconds : 0
NE Rx Unused Seconds : 0 FE Rx Unused Seconds : 0
NE Tx Num Failures : 0 NE Rx Num Failures : 0
```

```

FE Tx Num Failures : 0 FE Rx Num Failures : 0
Tx ICP Cell count : 0 Rx ICP Cell count : 0
Error ICP Cells Total : 0 Rx Lost ICP Cells Total : 0
Relative Link Delay : 0
=====
*A:ALU-1#

```

**Table 83 Show Port IMA Link Output Fields**

| Label                          | Description                                                            |
|--------------------------------|------------------------------------------------------------------------|
| <b>State Information</b>       |                                                                        |
| Transmit Link Identifier       | The identifier of the IMA link used to transmit data                   |
| Receive Link Identifier        | The identifier of the IMA link used to receive data                    |
| Near Rx Failure State          | The failure state of the near-end receive link                         |
| Far End Rx Failure State       | The failure state of the far-end receive link                          |
| Near End Tx State              | The state of the near-end transmit link                                |
| Near End Rx State              | The state of the near-end receive link                                 |
| Far End Tx State               | The state of the far-end transmit link                                 |
| Far End Rx State               | The state of the far-end receive link                                  |
| Link Test State                | The state of the link test procedure: Enabled or Disabled              |
| Rx Test Pattern                | The received test pattern in an IMA link loopback operation (0 to 255) |
| <b>TC Sublayer Information</b> |                                                                        |
| TC Alarm State                 | The alarm state for the traffic class of the IMA link                  |
| HEC Errors (Dropped)           | The number of HEC errors resulting in dropped packets                  |
| Number OCD Events              | The number of OCD events                                               |
| HEC Errors (Fixed)             | The number of HEC errors fixed                                         |
| <b>Statistical Information</b> |                                                                        |
| Num Violations                 | The number of violations (path, line, code, and length)                |
| NE Severely Err. Seconds       | The number of near-end severely errored seconds                        |
| NE Unavail. Seconds            | The number of seconds that the near end has been unavailable           |
| NE Tx Unused Seconds           | The number of seconds that the near-end transmit link has been unused  |

**Table 83 Show Port IMA Link Output Fields (Continued)**

| Label                    | Description                                                                                                                                                   |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NE Rx Unused Seconds     | The number of seconds that the near-end receive link has been unused                                                                                          |
| NE Tx Num Failures       | The number of near-end transmit link failures                                                                                                                 |
| FE Tx Num Failures       | The number of far-end transmit link failures                                                                                                                  |
| Tx ICP Cell count        | The number of ICP cells transmitted on the IMA link                                                                                                           |
| Error ICP Cells Total    | The total number of errored ICP cells on the IMA link                                                                                                         |
| Relative Link Delay      | The time delay, in seconds, between detection of a link activation/deactivation condition and acting upon it (going in/out of the Rx failure state on a link) |
| Num OIF Anomalies        | The number of OIF anomalies for the IMA link                                                                                                                  |
| FE Severely Err. Seconds | The number of far-end severely errored seconds                                                                                                                |
| FE Unavail. Seconds      | The number of seconds that the far end has been unavailable                                                                                                   |
| FE Tx Unused Seconds     | The number of seconds that the far-end transmit link has been unused                                                                                          |
| FE Rx Unused Seconds     | The number of seconds that the far end receive link has been unused                                                                                           |
| NE Rx Num Failures       | The number of near-end receive link failures                                                                                                                  |
| FE Rx Num Failures       | The number of far-end receive link failures                                                                                                                   |
| Rx ICP Cell count        | The number of ICP cells received on the IMA link                                                                                                              |
| Rx Lost ICP Cells Total  | The total number of lost ICP cells received on the IMA link                                                                                                   |

**Output Example**

```

*A:ALU-1># show port 1/4/1.5 ppp
=====
PPP Protocols for 1/4/1.5
=====
Protocol State Last Change Restart Count Last Cleared

lcp initial 10/12/2007 20:15:54 0 10/12/2007 20:15:54
ipcp initial 10/12/2007 20:15:54 0 10/12/2007 20:15:54
mplscp initial 10/12/2007 20:15:54 0 10/12/2007 20:15:54
bcp initial 10/12/2007 20:15:54 0 10/12/2007 20:15:54
osicp initial 10/12/2007 20:15:54 0 10/12/2007 20:15:54
ipv6cp initial 10/12/2007 20:15:54 0 10/12/2007 20:15:54
=====
=====

```



```

PPP Statistics
=====
Local Mac address : 68:83:01:04:00:01 Remote Mac address :
Local Magic Number : 0x0 Remote Magic Number: 0x0
Local address : 0.0.0.0 Remote address : 0.0.0.0
Line Monitor Method: keepalive
Keepalive statistics
Request interval : 10 Threshold exceeded : 0
Drop Count : 3 In packets : 0
Time to link drop : 00h00m30s Out packets : 0
Last cleared time : 10/12/2007 20:15:54
=====
*A:ALU-1>#

```

**Table 84 Show Port PPP Output Fields**

| Label                 | Description                                                                                                                                                                                                                                                                                                                    |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Protocol              | The applicable protocols for the specified port                                                                                                                                                                                                                                                                                |
| State                 | The current status of a PPP link. Values are initial, starting, closed, stopped, closing, stopping, requestSent, ackReceived, ackSent, opened.                                                                                                                                                                                 |
| Last Change           | The last time the PPP link state changed                                                                                                                                                                                                                                                                                       |
| Restart Count         | The number of times that this Control Protocol has reached the open state                                                                                                                                                                                                                                                      |
| <b>PPP Statistics</b> |                                                                                                                                                                                                                                                                                                                                |
| Last Cleared          | The date and time the restart count was set to zero                                                                                                                                                                                                                                                                            |
| Local Mac address     | The MAC address assigned to the local end of the PPP link                                                                                                                                                                                                                                                                      |
| Remote Mac address    | The Ethernet MAC address sent by the remote end of the PPP link                                                                                                                                                                                                                                                                |
| Local Magic Number    | The local magic number to be sent to the peer. The magic number provides a method to detect loopbacks. If the value of the local magic number is the same as the value of the remote magic number, then it is possible that the link might be looped back. If the two magic numbers do not match, the link is not looped back. |
| Remote Magic Number   | The magic number sent by the peer. If the value of the remote magic number is the same as the value of the local magic number, then it is possible that the link might be looped back. If the two magic numbers do not match, the link is not looped back.                                                                     |
| Local Address         | The IP address at the local end of the link                                                                                                                                                                                                                                                                                    |
| Remote Address        | The IP address at the remote end of the link                                                                                                                                                                                                                                                                                   |

**Table 84 Show Port PPP Output Fields (Continued)**

| Label               | Description                                                                                                  |
|---------------------|--------------------------------------------------------------------------------------------------------------|
| Line Monitor Method | The type of line monitoring packets being sent and received on this PPP link                                 |
| Request Interval    | The time interval in seconds at which keepalive requests are issued                                          |
| Threshold exceeded  | The number of times that the drop count was reached                                                          |
| Drop Count          | The number of keepalive or LQR messages that were missed before the line was brought down                    |
| In packets          | The number of echo-reply packets received                                                                    |
| Time to link drop   | The time remaining before the link will be declared dropped if a keepalive echo reply packet is not received |
| Out packets         | The number of echo-request packets sent                                                                      |
| Last cleared time   | The time since the last clear                                                                                |

**Output Example**

```
*A:ALU-1># show port cem
=====
Ports on Slot 1
=====
Port Admin Link Port Clock Master Clock
Id State State Src Port Id State

1/9/1.1.2 Up No Down differential 1/9/1.1.2.1 hold-over
1/9/1.1.3 Up No Down node-timed
1/9/1.1.4 Up No Down node-timed
...
=====
```

**Table 85 Show Port CEM Output Fields**

| Label          | Description                                          |
|----------------|------------------------------------------------------|
| Port Id        | The port ID, in the <i>slot/mda/port</i> format      |
| Admin State    | The administrative state of the interface connection |
| Link           | Indicates whether the link is active                 |
| Port State     | The state level of the port                          |
| Clock Src      | The clock source                                     |
| Master Port Id | The master port ID                                   |

**Table 85 Show Port CEM Output Fields (Continued)**

| Label       | Description     |
|-------------|-----------------|
| Clock State | The clock state |

**Output Example**

```
*A:ALU-1# show port 1/2/32.1 frame-relay
```

```
=====
Frame Relay Info for 1/2/32.1
=====
Mode : dce LMI Type : itu
FR Interface Status : fault
N391 DTE : 6 N392 DCE : 3
N392 DTE : 3 N393 DCE : 4
N393 DTE : 4 T392 DCE : 15
T391 DTE : 10
FRF-12 : Disabled
Link Identifier : N/A

Tx Status Enquiry : 1097 Rx Status Enquiry : 0
Rx Status Messages : 0 Tx Status Messages : 0
Status Message Timeouts : 1096 Status Enquiry Timeouts : 0
Discarded Messages : 0 Inv. RxSeqNum Messages : 0
=====
frame-relay statistics for port "1/2/32.1"
=====

```

|                   | Received | Transmitted |
|-------------------|----------|-------------|
| Frames            | 0        | 0           |
| Octets            | 0        | 0           |
| DEFrames          | 0        | 0           |
| DEOctets          | 0        | 0           |
| FECNFrames        | 0        | 0           |
| BECNFrames        | 0        | 0           |
| Invalid Dlci      | 0        | -           |
| Last Invalid Dlci | -        | -           |
| Crc Errors        | 0        | -           |
| Alignment Errors  | 0        | -           |
| Length Violations | 0        | -           |
| Illegal Header    | 0        | -           |
| Underruns Errors  | -        | 0           |
| Other Errors      | 0        | 0           |

```
=====
```

**Table 86 Show Port Frame Relay Output Fields**

| Label                                       | Description                                                                                                                                                                                                                                                                     |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Frame Relay Info for port identifier</b> |                                                                                                                                                                                                                                                                                 |
| Mode                                        | The frame relay mode: <ul style="list-style-type: none"> <li>• dce—specifies the DCE mode</li> <li>• dte—specifies the DTE mode</li> <li>• bidir—the bidirectional mode for LMI types ANSI and ITU</li> </ul>                                                                   |
| LMI Type                                    | The LMI type: <ul style="list-style-type: none"> <li>• ansi—specifies ANSI T1.617 Annex D</li> <li>• itu—specifies ITU-T Q933 Annex A</li> <li>• none—frame relay LMI is disabled on the port/channel</li> <li>• rev1—specifies Rev 1 version of ANSI T1.617 Annex D</li> </ul> |
| FR Interface Status                         | The status of the frame relay interface as determined by the performance of the DLCMI. If no DLCMI is running, the frame relay interface will stay in the running state indefinitely.                                                                                           |
| N391 DTE                                    | The DTE full status polling interval for the frame relay LMI. The number specifies the frequency at which inquiries expect a full status report.                                                                                                                                |
| N392 DCE                                    | The DCE error threshold for the frame relay LMI. The threshold specifies the number of errors needed to bring down a link.                                                                                                                                                      |
| N392 DTE                                    | The DTE error threshold for the frame relay LMI. The threshold specifies the number of errors needed to bring down a link.                                                                                                                                                      |
| N393 DCE                                    | The DCE monitored event count for the frame relay LMI                                                                                                                                                                                                                           |
| N393 DTE                                    | The DTE monitored event count for the frame relay LMI                                                                                                                                                                                                                           |
| T392 DCE                                    | The DCE keepalive timer for the frame relay LMI. The number specifies the interval at which the DCE checks for keepalive responses from the DTE.                                                                                                                                |
| T391 DTE                                    | The DTE keepalive timer for the frame relay LMI. The number specifies the interval at which the DTE sends a keepalive response request to the DCE.                                                                                                                              |
| FRF-12                                      | Not supported                                                                                                                                                                                                                                                                   |

**Table 86 Show Port Frame Relay Output Fields (Continued)**

| Label                                                                                   | Description                                                                                                                                                                                                                                                                                        |
|-----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Link Identifier                                                                         | The link associated with the frame relay port                                                                                                                                                                                                                                                      |
| Tx Status Enquiry                                                                       | The number of status enquiries sent                                                                                                                                                                                                                                                                |
| Rx Status Enquiry                                                                       | The number of status enquiries received                                                                                                                                                                                                                                                            |
| Rx Status Messages                                                                      | The number of status messages received                                                                                                                                                                                                                                                             |
| Tx Status Messages                                                                      | The number of status messages sent                                                                                                                                                                                                                                                                 |
| Status Message Timeouts                                                                 | The number of status message timeouts                                                                                                                                                                                                                                                              |
| Status Enquiry Timeouts                                                                 | The number of status enquiry timeouts                                                                                                                                                                                                                                                              |
| Discard Messages                                                                        | The number of status enquiry messages discarded due to errors                                                                                                                                                                                                                                      |
| Inv. RxSeqNum Messages                                                                  | The number of LMI messages received with an invalid sequence number                                                                                                                                                                                                                                |
| <b>frame-relay statistics for port <i>port-identifier</i> (input and output values)</b> |                                                                                                                                                                                                                                                                                                    |
| Frames                                                                                  | The number of frames received or transmitted                                                                                                                                                                                                                                                       |
| Octets                                                                                  | The number of octets received or transmitted                                                                                                                                                                                                                                                       |
| DEFrames                                                                                | The number of packets received or transmitted with the DE bit set                                                                                                                                                                                                                                  |
| DEOctets                                                                                | The number of octets received or transmitted with the discard eligibility (DE) bit set                                                                                                                                                                                                             |
| FECNFrames                                                                              | The number of frames received or transmitted with the forward explicit congestion notification bit set                                                                                                                                                                                             |
| BECNFrames                                                                              | The number of frames received or transmitted with the backward explicit congestion notification bit set                                                                                                                                                                                            |
| Invalid Dlci                                                                            | The number of invalid DLCIs                                                                                                                                                                                                                                                                        |
| Last Invalid Dlci                                                                       | The last time when an invalid DLCI was detected                                                                                                                                                                                                                                                    |
| Crc Errors                                                                              | The number of cyclical redundancy check errors                                                                                                                                                                                                                                                     |
| Alignment Errors                                                                        | The total number of packets received that had a length (excluding framing bits, but including FCS octets) of between 64 and 1518 octets, inclusive, but that had either a bad frame check sequence with an integral number of octets (FCS error) or a bad FCS with a non-integral number of octets |
| Length Violations                                                                       | The number of packet length violations                                                                                                                                                                                                                                                             |

**Table 86 Show Port Frame Relay Output Fields (Continued)**

| Label            | Description                                                                                                                    |
|------------------|--------------------------------------------------------------------------------------------------------------------------------|
| Illegal Header   | The number of header configuration errors                                                                                      |
| Underruns Errors | The number of frames that were unsuccessfully transmitted because transmission was not fast enough to maintain synchronization |
| Other Errors     | The number of other unspecified errors                                                                                         |

**Output Example**

```

*A:ALU-1# show port 1/2/32.1 frame-relay dlci 16
=====
Frame Relay Info for 1/2/32.1
=====
Mode : dte LMI Type : ansi
FR Interface Status : fault
N391 DTE : 6 N392 DCE : 3
N392 DTE : 3 N393 DCE : 4
N393 DTE : 4 T392 DCE : 15
T391 DTE : 10
FRF-12 : Disabled
Link Identifier : N/A
Tx Status Enquiry : 0 Rx Status Enquiry : 0
Rx Status Messages : 0 Tx Status Messages : 0
Status Message Timeouts : 0 Status Enquiry Timeouts : 0
Discarded Messages : 0 Inv. RxSeqNum Messages : 0
=====
Frame Relay PVCs
=====
Dlci State Type Creation Time

16 Inactive Static 07/11/2011 15:27:27

PVCs: 1
=====
frame-relay statistics for port "1/2/32.1" dlci "16"
=====
 Input Output

Frames 1077 2920112
Octets 0 4294967295
FECNs 32 3247074
BECNs 4294967295 1837088656
DE Frames 3621691 68756528
DE Octets 1990621688 1
Discards 1893384560 2920112
Crc Discard 2 -
Aborts 56295902 -
Other Discard 1837088656 -
=====
*A:ALU-1#

```

**Table 87 Show Port Frame Relay DLCI Output Fields**

| Label                                                                                   | Description                                                                       |
|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| <b>Frame Relay Info for <i>port-identifier</i></b>                                      |                                                                                   |
| See <a href="#">Table 86</a>                                                            | —                                                                                 |
| <b>Frame Relay PVCs</b>                                                                 |                                                                                   |
| Dlci                                                                                    | The specified DLCI                                                                |
| State                                                                                   | The port state                                                                    |
| Type                                                                                    | The port type                                                                     |
| Creation Time                                                                           | The time at which the port was created                                            |
| PVCs                                                                                    | The number of PVCs                                                                |
| <b>frame-relay statistics for port <i>port-identifier</i> (input and output values)</b> |                                                                                   |
| Frames                                                                                  | The number of frames received or transmitted                                      |
| Octets                                                                                  | The number of octets received or transmitted                                      |
| DE Frames                                                                               | The number of packets received or transmitted with the DE bit set                 |
| DE Octets                                                                               | The number of octets received or transmitted with the discard eligibility bit set |
| Crc Discard                                                                             | The number of cyclical redundancy check discards                                  |
| Aborts                                                                                  | The number of aborts                                                              |
| Other Discard                                                                           | The number of other discards                                                      |

**Output Example**

```
*A:7705:Dut-C#show port 1/10/9.1 detail
=====
TDM DS0 Chan Group
=====
Description : DS0GRP
Interface : 1/10/9.1
TimeSlots : 2-32
Speed : 64
Admin Status : up
Last State Change : 07/12/2011 08:17:15
CRC : 16
Oper Status : up
Chan-Grp IfIndex : 591691837

Configured mode : access
Admin MTU : 1514
Scramble : false
Physical Link : yes
Idle Cycle Flags : flags
Encap Type : hdlc
Oper MTU : 1514
Bundle Number : none
Load-balance-algo : n/a
```

```

Payload Fill Type : n/a Payload Pattern : N/A
Signal Fill Type : n/a Signal Pattern : N/A
Ing. Pool % Rate : 100 Egr. Pool % Rate : 100
Egr. Sched. Pol : N/A
=====

=====
Traffic Statistics
=====
 Input Output

Octets 304520 301852
Packets 3310 3281
Errors 0 0
=====

Port Statistics
=====
 Input Output

Packets 3310 3281
Discards 0 0
Unknown Proto Discards 0
=====
*A:7705:Dut-C# configure port 1/10/9

*A:7705:Dut-C# show port detail 1/5/1.1
=====
TDM DS0 Chan Group
=====
Description : DS0GRP
Interface : 1/5/1.1
TimeSlots : 2-32
Speed : 64
Admin Status : up
Last State Change : 07/12/2011 08:17:18
CRC : 16
Oper Status : up
Chan-Grp IfIndex : 580943933

Configured mode : access
Admin MTU : 1514
Scramble : false
Physical Link : yes
Idle Cycle Flags : flags
Payload Fill Type : n/a
Signal Fill Type : n/a
Ing. Pool % Rate : 100
Egr. Sched. Pol : N/A
Encap Type : cisco-hdlc
Oper MTU : 1514
Bundle Number : none
Load-balance-algo : n/a
Payload Pattern : N/A
Signal Pattern : N/A
Egr. Pool % Rate : 100
=====

=====
Traffic Statistics
=====
 Input Output

Octets 301852 304520
Packets 3281 3310
Errors 0 0
=====

```



```

Port Statistics
=====
 Input Output

Packets 3281 3310
Discards 0 0
Unknown Proto Discards 0
=====
*A:7705:Dut-C# configure port 1/10/9

*A:7705:Dut-C# config>port>serial>x21>channel-group# show port 1/3/1.1
=====
Serial DS0 Chan Group
=====
Description : DS0GRP
Interface : 1/3/1.1
CRC : 16
Admin Status : down Oper Status : down
Last State Change : 01/27/2012 14:32:01 Chan-Grp IfIndex : 576749629
Configured Mode : access Encap Type : cisco-hdlc
Admin MTU : 1514 Oper MTU : 1514
Physical Link : No Bundle Number : none
Idle Cycle Flags : flags
Payload Fill Type : n/a Payload Pattern : n/a
=====
Traffic Statistics
=====
 Input Output

Octets 118222 30008
Packets 1640 1364
Errors 0 0
=====
Port Statistics
=====
 Input Output

Packets 1640 1364
Discards 0 0
Unknown Proto Discards 0
=====

*A:7705:Dut-C# config>port>serial>x21>channel-group# show port 1/3/8
=====
Serial RS-232 Physical Interface
=====
Description : ozgur
Interface : 1/3/8 Port IfIndex : 40108032
Admin Status : up Oper Status : up
Physical Link : Yes
Type : v35
=====
=====

```

```

Port Statistics
=====
 Input Output

Packets 0 0
Discards 0 0
Unknown Proto Discards 0
=====
*A:7705:Dut-C# config>port>serial>x21>channel-group#

*A:7705:Dut-C# config>port>serial>x21>channel-group# show port 1/3/8.1 detail
=====
Serial DS0 Chan Group
=====
Description : DS0GRP
Interface : 1/3/8.1
CRC : 32
Admin Status : up
Last State Change : 01/27/2012 10:37:44
Configured Mode : access
Admin MTU : 1514
Physical Link : Yes
Idle Cycle Flags : flags
Payload Fill Type : n/a
Oper Status : up
Chan-Grp IfIndex : 576979019
Encap Type : hdlc
Oper MTU : 1514
Bundle Number : none
Payload Pattern : n/a
=====
Traffic Statistics
=====
 Input Output

Octets 0 0
Packets 0 0
Errors 0 0
=====
Port Statistics
=====
 Input Output

Packets 0 0
Discards 0 0
Unknown Proto Discards 0
=====
*A:7705:Dut-C# config>port>serial>x21>channel-group#

```

### Output Example

```

*A:ALU-1># show port 1/1/3
=====
TDM Data Physical Interface
=====
Description : G.703 64kbps Codirectional
Interface : 1/1/3
Admin Status : down
Physical Link : No
Type : codir
Port IfIndex : 39878656
Oper Status : down
=====
=====

```

```

Port Statistics
=====
 Input Output

Packets 0 0
Discards 0 0
Unknown Proto Discards 0
=====

*A:ALU-1># show port 1/2/3.codir detail
=====
TDM Data Interface
=====
Description : CODIR
Interface : 1/2/3.codir
Type : codir
Admin Status : down Oper Status : down
Physical Link : no Clock Source : node-timed
Timing 8khz : Disabled
Last State Change : 05/27/2013 12:42:10 Channel IfIndex : 574717955
Loopback : none
Cfg Alarm : ais los
Alarm Status : los
=====
=====
Traffic Statistics
=====
 Input Output

Octets 0 0
Packets 0 0
Errors 0 0
=====
Codir Line
=====
Receive:
Data-slip : 0
=====
Port Statistics
=====
 Input Output

Packets 0 0
Discards 0 0
Unknown Proto Discards 0
=====
*A:ALU-1>#

```

**Table 88 Show Port Output Fields (TDM Codirectional or TPIF)**

| Label                                                           | Description                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>TDM Data Physical Interface</b><br><b>TDM Data Interface</b> |                                                                                                                                                                                                                                                                                                                                                                   |
| Description                                                     | A text description of the port                                                                                                                                                                                                                                                                                                                                    |
| Interface                                                       | The port ID displayed in the <i>slot/mda/port</i> format                                                                                                                                                                                                                                                                                                          |
| Port IfIndex                                                    | The port interface's index number, which reflects its initialization sequence                                                                                                                                                                                                                                                                                     |
| Admin Status                                                    | up: the administrative state is up                                                                                                                                                                                                                                                                                                                                |
|                                                                 | down: the administrative state is down                                                                                                                                                                                                                                                                                                                            |
| Oper Status                                                     | up: the operating state is up                                                                                                                                                                                                                                                                                                                                     |
|                                                                 | down: the operating state is down                                                                                                                                                                                                                                                                                                                                 |
| Physical Link                                                   | yes: a physical link is present                                                                                                                                                                                                                                                                                                                                   |
|                                                                 | no: a physical link is not present                                                                                                                                                                                                                                                                                                                                |
| Type                                                            | The type of interface: codirectional or TPIF                                                                                                                                                                                                                                                                                                                      |
| Clock Source                                                    | loop-timed: the link recovers the clock from the received data stream<br>node-timed: the link uses the internal clock when transmitting data<br>adaptive: clocking is derived from the incoming pseudowire packets<br>differential: clocking is derived from a common clock compared to differential clock recovery data in the RTP header in the TDM PW overhead |
| Timing 8khz                                                     | Indicates whether 8-kb/s timing on a codirectional interface is enabled or disabled                                                                                                                                                                                                                                                                               |
| Last State Change                                               | The last time the operational status of the port changed state                                                                                                                                                                                                                                                                                                    |
| Channel IfIndex                                                 | The channel interface index number                                                                                                                                                                                                                                                                                                                                |
| Loopback                                                        | The loopback mode for the channel: internal-analog, internal-digital, or none                                                                                                                                                                                                                                                                                     |
| Cfg Alarm                                                       | The type of alarms to be logged and reported for the port                                                                                                                                                                                                                                                                                                         |
| Alarm Status                                                    | The current alarm state                                                                                                                                                                                                                                                                                                                                           |

**Table 88 Show Port Output Fields (TDM Codirectional or TPIF)**

| Label                     | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Traffic Statistics</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Octets Input/Output       | The total number of octets received and transmitted on the port                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Packets Input/Output      | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                                                                                                         |
| Errors Input/Output       | <p>For packet-oriented interfaces, the number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol. For character-oriented or fixed-length interfaces, the number of inbound transmission units that contained errors preventing them from being deliverable to a higher-layer protocol.</p> <p>For packet-oriented interfaces, the number of outbound packets that could not be transmitted because of errors. For character-oriented or fixed-length interfaces, the number of outbound transmission units that could not be transmitted because of errors.</p> |
| <b>Codir Line</b>         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Data-slip:                | In a plesiochronous timing system, the number of data slips that have occurred in the receive direction                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Port Statistics</b>    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Packets Input/Output      | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                                                                                                         |
| Discards Input/Output     | The number of inbound/outbound packets chosen to be discarded to possibly free up buffer space                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

**Table 88 Show Port Output Fields (TDM Codirectional or TPIF)**

| Label                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Unknown Proto Discards Input/Output | For packet-oriented interfaces, the number of packets received at the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received at the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0. |

**Output Example**

```
*A:ALU-1># show port 1/3/1
```

```
=====
GNSS Physical Interface
=====
Description : GNSS Rx
Interface : 1/3/1 Port IfIndex : 39878656
Admin Status : up Oper Status : up
Physical Link : Yes
Type : gps
Ant. Cable Delay : 0 Elev. Mask Angle : 10
Antenna Status : ok Visible Satellites : 9
Sync Status : locked Used Satellites : 7
Receiver Status : Position Hold
Time : 2014/04/23 18:47:38 Latitude : +45.34811
UTC Offset : 17 Longitude : -75.92142
 Altitude (m MSL) : 90
=====
```

**Table 89 Show Port Output Fields (GNSS)**

| Label         | Description                                                                                     |
|---------------|-------------------------------------------------------------------------------------------------|
| Description   | Specifies the GNSS RF port description                                                          |
| Interface     | Specifies the card, MDA, and port number of the GNSS RF port                                    |
| Admin Status  | up: the port is administratively up<br>down: the port is administratively down                  |
| Physical Link | yes: an operational GNSS antenna is detected<br>no: an operational GNSS antenna is not detected |
| Type          | Specifies the type of satellite navigation system used                                          |

**Table 89 Show Port Output Fields (GNSS) (Continued)**

| Label            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ant. Cable Delay | Specifies the amount of time, in nanoseconds, compensated for signal delay due to cable length                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Antenna Status   | <p>ok: valid antenna connection</p> <p>under-current: open condition. Previously, an under-current status caused the port operational status to be down. Currently, the port remains operationally up in the event that any GNSS splitters used do not provide a load.</p> <p>over-current: short circuit, or maximum power limits for the receiver have been exceeded</p> <p>no-bias voltage: antenna power disabled</p>                                                                                                                                                                                                                                                                  |
| Sync Status      | <p>locked: GNSS time is within alarm limits (1 <math>\mu</math>s)</p> <p>not locked: GNSS time is outside of the alarm limits and/or there is an insufficient number of tracked satellites</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Receiver Status  | <p>Acquiring Satellites: GNSS receiver is attempting to track satellite</p> <p>Position Hold: TRAIM algorithm is correcting for time bias</p> <p>2D Fix: GNSS receiver is attempting to get a 2D fix on a satellite</p> <p>3D Fix: GNSS receiver is attempting to get a 3D fix on a satellite</p> <p>Unknown: default state on power-up</p> <p>Communication Lost: occurs after 30 s of missing Channel/Data/Status messages or TRAIM status messages from the GNSS receiver</p> <p>Communication Established: occurs after a successful re-establishment of communication following a Communication Lost status</p> <p>Self-Test Failed: occurs after a GNSS receiver startup failure</p> |
| Time             | Specifies the GNSS system date and time                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| UTC Offset       | <p>Specifies the difference between GNSS time and UTC time</p> <p><i>UTC time = GNSS time – UTC offset</i></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Port IfIndex     | Specifies the GNSS interface index number, which reflects its initialization sequence                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

**Table 89 Show Port Output Fields (GNSS) (Continued)**

| Label              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Oper Status        | up: the port is operationally up (communication with the GNSS receiver is established, the self-test has passed, and the antenna status is OK)<br>down: the port is operationally down (any of the up conditions have not been met)                                                                                                                                                                                                              |
| Elev. Mask Angle   | Specifies the configured elevation angle below which satellites are ignored. The default elevation mask angle is 10°.                                                                                                                                                                                                                                                                                                                            |
| Visible Satellites | Specifies the number of satellites that the GNSS receiver should see at the current time. This number can be 0 if the GNSS receiver has not yet downloaded an almanac, even if Used Satellites is more than 0.<br><br>Five or more satellites must be in view of the GNSS receiver antenna at all times when the receiver is in the process of obtaining a position fix, and these satellites must be above the configured elevation mask angle. |
| Used Satellites    | Specifies the number of tracked satellites                                                                                                                                                                                                                                                                                                                                                                                                       |
| Latitude           | Specifies the latitude of the GNSS antenna                                                                                                                                                                                                                                                                                                                                                                                                       |
| Longitude          | Specifies the longitude of the GNSS antenna                                                                                                                                                                                                                                                                                                                                                                                                      |
| Altitude (m MSL)   | Specifies the altitude of the GNSS antenna above mean sea level, in meters                                                                                                                                                                                                                                                                                                                                                                       |

## dsl

**Syntax** `dsl [efm-oam | line-num]`

**Context** `show>port>dsl`

**Description** This command displays DSL port information

**Parameters** **efm-oam** — displays EFM-OAM information for DSL ports

*line-num* — displays DSL line information

**Values** 1 to 8

**Output** The following output is an example of DSL port information and [Table 90](#) describes the fields.

### Output Example

SHDSL port information



```

A:ALU-1># show port 1/3/1 dsl 1
=====
SHDSL Line Information
=====
DSL PortId : 1/3/1 Line : 1
Admin State : up State : stop
Protocol : a-f Data Rate : 0 kbps
Negotiated Consellation : 32 pam Capability List Mode : autoD
TpsTcType : efm In Bonding Group : false
Attenuation : 0 db SNRMargin : 0
Power Back Off : 0 db
=====
SHDSL Line Statistics
=====
Link Loss : 0 Code Violation : 0
ES : 0 SES : 0
LOSWS : 0 UAS : 0
=====

```

### xDSL port information

```

A:ALU-1># show port 1/3/2 dsl 1
=====
XDSL Line Information
=====
DSL PortId : 1/3/2 Line : 1
Oper State : down State : runInit
In Bonding Group : false Admin State : up
Protocol : g993-2 Vdsl Profile : 17a
TpsTcType : atm
US Bit Rate : 0 kbps
US Failure : Unavail-time Not-showtime Loss-Signal
US SNR Margin : 0 US Output Power : 0
US Ref Psd : -380 US Loop Delay : 0
US B0 Delay : 0 US B0 INP : 0
DS Bit Rate : 0 kbps
DS Failure : Unavail-time Not-showtime Loss-Signal
DS SNR Margin : 0 DS Output Power : 0
DS Ref Psd : 0 DS Loop Delay : 0
DS B0 Delay : 0 DS B0 INP : 0
=====
XDSL Line Statistics
=====
Near End FECS : 0 Near End LOSS : 0
Near End ES : 0 Near End SES : 0
Near End UAS : 16 Near End AS : 0
Near End LOFS : 0 Near End LPRS : 16
Near End LEFTRS : 0
Far End FECS : 0 Far End LOSS : 0
Far End ES : 0 Far End SES : 0
Far End UAS : 16 Far End AS : 0
Far End LOFS : 0 Far End LPRS : 0
Far End LEFTRS : 0
Up Time : 0
=====

```

**Table 90 Show DSL Port Output Fields**

| Label                         | Description                                                                             |
|-------------------------------|-----------------------------------------------------------------------------------------|
| <b>SHDSL Line Information</b> |                                                                                         |
| DSL PortId                    | The DSL port identifier                                                                 |
| Line                          | The DSL line number                                                                     |
| Admin State                   | Up: the DSL port is administratively up                                                 |
|                               | Down: the DSL port is administratively down                                             |
| State                         | The training state of the DSL line                                                      |
| Protocol                      | The regional configuration learned from the Central Office:<br>a-f : Annex A/F Region 1 |
|                               | b-g: Annex B/F Region 2                                                                 |
| Data Rate                     | The data rate configured on the DSL port                                                |
| Negotiated Consellation       | TC-PAM modulation selection for the SHDSL span                                          |
| Capability List Mode          | The handshake mode for the span                                                         |
| TpsTcType                     | The SHDSL span transport channel operational mode                                       |
| In Bonding Group              | The bonding status of the DSL line                                                      |
| Attenuation                   | SHDSL line attenuation                                                                  |
| SNRMargin                     | The signal to noise ratio margin of line                                                |
| Power Back Off                | Indicates whether Power Back is off                                                     |
| <b>SHDSL Line Statistics</b>  |                                                                                         |
| Link Loss                     | The link loss counter                                                                   |
| Code Violation                | The code violation error counter                                                        |
| ES                            | Errored seconds                                                                         |
| SES                           | The number of severely errored seconds                                                  |
| LOSWS                         | The loss of sync word seconds                                                           |
| UAS                           | Unavailable seconds                                                                     |
| <b>XDSL Line Information</b>  |                                                                                         |
| DSL PortId                    | The DSL port identifier                                                                 |
| Line                          | The DSL line number                                                                     |

**Table 90 Show DSL Port Output Fields (Continued)**

| Label                       | Description                                                  |
|-----------------------------|--------------------------------------------------------------|
| Oper State                  | Up: the DSL port is operationally up                         |
|                             | Down: the DSL port is operationally down                     |
| State                       | The state of the DSL line                                    |
| In Bonding Group            | The state of the DSL line in bonding group                   |
| Admin State                 | Up: the DSL port is administratively up                      |
|                             | Down: the DSL port is administratively down                  |
| Protocol                    | The xDSL protocol used on the DSL line                       |
| Vdsl Profile                | The VDSL profile used on the line                            |
| TpsTcType                   | The transport protocol used by the DSL line                  |
| US Bit Rate                 | The trained upstream bit rate in kb/s                        |
| US Failure                  | The bitmap for the current upstream failure                  |
| US SNR Margin               | The upstream signal to noise margin in tenths of db          |
| US Output Power             | The upstream power output in tenths of db                    |
| US Loop Delay               | The upstream loop delay in ms                                |
| US Ref Psd                  | The upstream reference power spectral density                |
| US B0 INP                   | The upstream impulse noise protection (unit is 1/2 symbol)   |
| US B0 Delay                 | The upstream B0 latency path delay, in ms                    |
| DS Bit Rate                 | The trained downstream bit rate in kb/s                      |
| DS Failure                  | The bitmap for the current downstream failure                |
| DS SNR Margin               | The downstream signal to noise margin in tenths of db        |
| DS Output Power             | The downstream power output in tenths of db                  |
| DS Ref Psd                  | The downstream reference power spectral density              |
| DS Loop Delay               | The downstream loop delay, in ms                             |
| DS B0 Delay                 | The downstream B0 latency path delay, in ms                  |
| DS B0 INP                   | The downstream impulse noise protection (unit is 1/2 symbol) |
| <b>XDSL Line Statistics</b> |                                                              |

**Table 90 Show DSL Port Output Fields (Continued)**

| Label           | Description                                          |
|-----------------|------------------------------------------------------|
| Near End FECS   | The near end forward error correction seconds        |
| Near End LOSS   | The near end loss of signal seconds                  |
| Near End ES     | The near end errored seconds                         |
| Near End SES    | The near end severely errored seconds                |
| Near End UAS    | The near end unavailable seconds                     |
| Near End AS     | The near end available seconds                       |
| Near End LOFS   | The near end loss of framing seconds                 |
| Near End LPRS   | The near end loss of power seconds                   |
| Near End LEFTRS | The near end low error-free throughput rate seconds  |
| Far End FECS    | The far end forward error correction seconds         |
| Far End LOSS    | The far end loss of signal seconds                   |
| Far End ES      | The far end errored seconds                          |
| Far End SES     | The far end severely errored seconds                 |
| Far End UAS     | The far end unavailable seconds                      |
| Far End AS      | The far end available seconds                        |
| Far End LOFS    | The far end loss of framing seconds                  |
| Far End LPRS    | The far end loss of power seconds                    |
| Far End LEFTRS  | The far end low error-free throughput rate seconds   |
| Up Time         | The length of time the DSL port has been operational |

## lldp

- Syntax** `lldp [nearest-bridge | nearest-non-tpmr | nearest-customer] [remote-info] [detail]`
- Context** `show>port>ethernet`
- Description** This command displays LLDP information.
- Parameters**
- nearest-bridge** — displays nearest bridge information
  - nearest-non-tpmr** — displays nearest non-two-port MAC relay (TPMR) information
  - nearest-customer** — displays nearest customer information

**remote-info** — displays remote information on the bridge MAC

**detail** — displays detailed LLDP information

**Output** The following outputs are examples of LLDP information:

- LLDP ([Output Example, Table 91](#))
- LLDP Detail ([Output Example, Table 92](#))

### Output Example

```
*A:ALU-1># show port 1/2/2 ethernet lldp
=====
Link Layer Discovery Protocol (LLDP) Port Information
=====
Port 1/2/2 Bridge nearest-bridge

Admin State : txAndRx Notifications : Disabled
Transmit TLVs : portDesc sysCap
Management Address Transmit Configuration:
Index 1 (system) : Enabled Address : 10.20.30.40
Port 1/2/2 Bridge nearest-non-tpmr

Admin State : disabled Notifications : Disabled
Transmit TLVs : None
Management Address Transmit Configuration:
Index 1 (system) : Disabled Address : 10.20.30.40
Port 1/2/2 Bridge nearest-customer

Admin State : disabled Notifications : Disabled
Transmit TLVs : None
Management Address Transmit Configuration:
Index 1 (system) : Disabled Address : 10.20.30.40
=====
*A:ALU-1>#
```

**Table 91** Show Port LLDP Output Fields

| Label         | Description                                         |
|---------------|-----------------------------------------------------|
| Admin State   | The LLDP transmission/reception frame handling      |
| Notifications | Indicates whether LLDP notifications are enabled    |
| Transmit TLVs | The optional TLVs that are transmitted by this port |

**Table 91 Show Port LLDP Output Fields (Continued)**

| Label                                            | Description                                                                                                                                                                                                                                                                                             |
|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Management Address Transmit Configuration</b> |                                                                                                                                                                                                                                                                                                         |
| Index 1 (system)                                 | Details of the management address configuration. The 7705 SAR can only be configured to send or not send the system address.<br><br>Enabled: the management address TLV is included in LLDPDUs sent by the port<br><br>Disabled: the management address TLV is not included in LLDPDUs sent by the port |
| Address                                          | The address transmitted by the port when tx-mgmt-address command is enabled                                                                                                                                                                                                                             |

**Output Example**

```
*A:ALU-1># show port 1/2/2 ethernet lldp nearest-bridge detail
=====
Link Layer Discovery Protocol (LLDP) Port Information
=====
Port 1/2/2 Bridge nearest-bridge

Admin State : txAndRx Notifications : Disabled
Transmit TLVs : portDesc sysCap
Management Address Transmit Configuration:
Index 1 (system) : Enabled Address : 10.20.30.40
Port LLDP Stats:
Tx Frames : 13 Tx Length Err Frames : 0
Rx Frames : 0 Rx Frame Discard : 0
Rx Frame Errors : 0 Rx TLV Discard : 0
Rx TLV Unknown : 0 Rx Ageouts : 0
=====
*A:ALU-1>#

*A:ALU-1># show port 1/2/2 ethernet lldp nearest-bridge remote-info detail
=====
Link Layer Discovery Protocol (LLDP) Port Information
=====
Port 1/2/2 Bridge nearest-bridge Remote Peer Information

Remote Peer Index 2 at timestamp 12/02/2014 16:08:14:
Supported Caps : bridge router
Enabled Caps : bridge router
Chassis Id Subtype : 4 (macAddress)
Chassis Id : ac:fa:ff:00:00:00
PortId Subtype : 1 (interfaceAlias)
Port Id : 37814272
Port Description : 2/1/2, 10/100
Gig Eth SFP, "remport1" (based on ifDesc from RFC2863)
System Name : n/a
System Description : n/a
Remote Peer Index 2 management addresses at time 12/02/2014 16:08:14:
```

No remote management addresses found

=====

\*A:ALU-1>#

**Table 92 Show Port LLDP Detail Output Fields**

| Label                  | Description                                                                                                                                                                                                                                                                                                                        |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Admin State            | The LLDP transmission/reception frame handling                                                                                                                                                                                                                                                                                     |
| Notifications          | Indicates whether LLDP notifications are enabled                                                                                                                                                                                                                                                                                   |
| Transmit TLVs          | The optional TLVs that are transmitted by this port                                                                                                                                                                                                                                                                                |
| Index 1 (system)       | Details of the management address configuration. The 7705 SAR can only be configured to send or not send the system address.<br>Enabled: the management address TLV is included in LLDPDUs sent by the port<br>Disabled: the management address TLV is not included in LLDPDUs sent by the port                                    |
| Enabled Address        | The address transmitted by the port when the management address TLV is included in LLDPDUs sent by the port                                                                                                                                                                                                                        |
| <b>Port LLDP Stats</b> |                                                                                                                                                                                                                                                                                                                                    |
| Tx Frames              | The number of LLDP frames transmitted                                                                                                                                                                                                                                                                                              |
| Tx Length Err Frames   | The number of frames with LLDPDU length violations caused by too many TLVs selected by the network manager. The packets are sent containing the mandatory TLVs and the maximum number of optional TLVs that will fit in the LLDP frame.                                                                                            |
| Rx Frames              | The number of LLDP frames received                                                                                                                                                                                                                                                                                                 |
| Rx Frame Discard       | The number of LLDP frames received by the LLDP agent that were discarded for any reason.<br>This counter can provide an indication that LLDP header formatting problems may exist with the local LLDP agent in the sending system, or that LLDPDU validation problems may exist with the local LLDP agent in the receiving system. |
| Rx Frame Errors        | The number of invalid LLDP frames received by the LLDP agent on the indicated port while the LLDP agent is enabled                                                                                                                                                                                                                 |
| Rx TLV Discard         | The number of LLDP TLVs discarded for any reason by the LLDP agent on the indicated port                                                                                                                                                                                                                                           |

**Table 92 Show Port LLDP Detail Output Fields (Continued)**

| Label              | Description                                                                                                                         |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| Rx TLV Unknown     | The number of LLDP TLVs received that are not recognized by the LLDP agent                                                          |
| Rx Ageouts         | The number of age-outs that have occurred on the port                                                                               |
| Supported Caps     | Describes the system capabilities supported by the remote peer                                                                      |
| Enabled Caps       | Describes the system capabilities enabled on the remote peer                                                                        |
| Chassis Id Subtype | An integer value and text definition that indicates the basis for the chassis ID entity listed in the chassis ID field              |
| Chassis Id         | The chassis identifier of the chassis containing the Ethernet port that sent the LLDPDU                                             |
| PortId Subtype     | An integer value and text definition that indicates the basis for the port ID entity listed in the port ID field                    |
| Port Id            | The port identifier of the Ethernet port that sent the LLDPDU                                                                       |
| Port Description   | Describes the port that sent the LLDPDU and indicates that the description is the ifDescr object text string from RFC 2863 - IF MIB |
| System Name        | The name of the system that sent the LLDPDU                                                                                         |
| System Description | Describes the system that sent the LLDPDU                                                                                           |



### 3.14.2.1.6 Show ATM Port Commands

#### port

|               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                |                |                                                                     |  |             |   |  |            |                                              |  |             |                                                                                                                                                                                                                                                                |  |                |                               |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------------------------------------------------------------|--|-------------|---|--|------------|----------------------------------------------|--|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|----------------|-------------------------------|
| Syntax        | <b>port</b> <i>port-id</i> <b>atm</b><br><b>port</b> <i>port-id</i> <b>atm connections</b><br><b>port</b> <i>port-id</i> <b>atm pvc</b> [ <i>vpi/vci</i> ] [ <b>detail</b> ]<br><b>port</b> <i>port-id</i> <b>atm pvp</b> [ <i>vpi</i> ] [ <b>detail</b> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                |                |                                                                     |  |             |   |  |            |                                              |  |             |                                                                                                                                                                                                                                                                |  |                |                               |
| Context       | show                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                |                |                                                                     |  |             |   |  |            |                                              |  |             |                                                                                                                                                                                                                                                                |  |                |                               |
| Description   | <p>This command displays ATM port information.</p> <p>If no command line options are specified, the command port displays summary information for all ports on provisioned adapter cards.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                |                |                                                                     |  |             |   |  |            |                                              |  |             |                                                                                                                                                                                                                                                                |  |                |                               |
| Parameters    | <p><i>port-id</i> — specifies the physical port ID</p> <table><tr><td><b>Syntax</b></td><td><i>port-id</i></td><td><i>slot[/mda[/port]]</i> or <i>slot/mda/port[.channel]</i>, where:</td></tr><tr><td></td><td><i>slot</i></td><td>1</td></tr><tr><td></td><td><i>mda</i></td><td>1 to 6 (7705 SAR-8)<br/>1 to 12 (7705 SAR-18)</td></tr><tr><td></td><td><i>port</i></td><td>1 to 2 (2-port OC3/STM1 Channelized Adapter card ports)<br/>1 to 4 (4-port OC3/STM1 Clear Channel Adapter card ports or 4-port DS3/E3 Adapter card ports)<br/>1 to 16 (16-port T1/E1 ASAP Adapter card ports)<br/>1 to 32 (32-port T1/E1 ASAP Adapter card ports)</td></tr><tr><td></td><td><i>channel</i></td><td>1 to 24 (DS1) or 1 to 32 (E1)</td></tr></table> <p><b>atm</b> — displays ATM information</p> <p><b>connections</b> — displays ATM connection information</p> <p><b>pvc</b> — displays ATM port PVC information</p> <p><b>pvp</b> — displays ATM port PVP information</p> <p><i>vpi/vci</i> — vpi: 0 to 4095 (NNI; not supported on SONET/SDH ports), 0 to 255 (UNI)<br/>vci: 1, 2, 5 to 65534</p> <p><b>detail</b> — provides detailed information</p> | <b>Syntax</b>                                                                                                                                                                                                                                                  | <i>port-id</i> | <i>slot[/mda[/port]]</i> or <i>slot/mda/port[.channel]</i> , where: |  | <i>slot</i> | 1 |  | <i>mda</i> | 1 to 6 (7705 SAR-8)<br>1 to 12 (7705 SAR-18) |  | <i>port</i> | 1 to 2 (2-port OC3/STM1 Channelized Adapter card ports)<br>1 to 4 (4-port OC3/STM1 Clear Channel Adapter card ports or 4-port DS3/E3 Adapter card ports)<br>1 to 16 (16-port T1/E1 ASAP Adapter card ports)<br>1 to 32 (32-port T1/E1 ASAP Adapter card ports) |  | <i>channel</i> | 1 to 24 (DS1) or 1 to 32 (E1) |
| <b>Syntax</b> | <i>port-id</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <i>slot[/mda[/port]]</i> or <i>slot/mda/port[.channel]</i> , where:                                                                                                                                                                                            |                |                                                                     |  |             |   |  |            |                                              |  |             |                                                                                                                                                                                                                                                                |  |                |                               |
|               | <i>slot</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1                                                                                                                                                                                                                                                              |                |                                                                     |  |             |   |  |            |                                              |  |             |                                                                                                                                                                                                                                                                |  |                |                               |
|               | <i>mda</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 1 to 6 (7705 SAR-8)<br>1 to 12 (7705 SAR-18)                                                                                                                                                                                                                   |                |                                                                     |  |             |   |  |            |                                              |  |             |                                                                                                                                                                                                                                                                |  |                |                               |
|               | <i>port</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1 to 2 (2-port OC3/STM1 Channelized Adapter card ports)<br>1 to 4 (4-port OC3/STM1 Clear Channel Adapter card ports or 4-port DS3/E3 Adapter card ports)<br>1 to 16 (16-port T1/E1 ASAP Adapter card ports)<br>1 to 32 (32-port T1/E1 ASAP Adapter card ports) |                |                                                                     |  |             |   |  |            |                                              |  |             |                                                                                                                                                                                                                                                                |  |                |                               |
|               | <i>channel</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1 to 24 (DS1) or 1 to 32 (E1)                                                                                                                                                                                                                                  |                |                                                                     |  |             |   |  |            |                                              |  |             |                                                                                                                                                                                                                                                                |  |                |                               |

**Output** The following outputs are examples of ATM information:

- ATM ([Output Example, Table 93](#))
- ATM Connections ([Output Example, Table 94](#))
- ATM PVC ([Output Example, Table 95](#))
- ATM PVC VPI/VCI ([Output Example, Table 96](#))
- ATM PVC VPI/VCI Detail ([Output Example, Table 97](#))
- ATM PVP ([Output Example, Table 98](#))
- ATM PVP Detail ([Output Example, Table 99](#))

### Output Example

```
*A:ALU-1># show port 1/1/3.sts3 atm
=====
ATM Info for 1/1/3
=====
Cell Mode : UNI Mapping : Direct
Configured VCs : 0 Configured VPs : 0
Configured VTs : 0 Configured IFCs : 0
Configured minimum VPI: 0
Last Unknown VPI/VCI : none
=====
TC Sublayer Information
=====
TC Alarm State : LCD Failure Number OCD Events : 0
HEC Errors (Dropped) : 0 HEC Errors (Fixed) : 0
=====
ATM Bandwidth Info
=====
 kbps % kbps %

Ingress CBR : 0 0% Egress CBR : 0 0%
Ingress RT-VBR : 0 0% Egress RT-VBR : 0 0%
Ingress NRT-VBR : 0 0% Egress NRT-VBR : 0 0%
Ingress UBR : 0 0% Egress UBR : 0 0%

Ingress Total : 0 0% Egress Total : 0 0%
ATM Link Bandwidth : 149760 kbps
Shaped Bandwidth : 0 kbps
=====
```

**Table 93** Show Port ATM Output Fields

| Label          | Description                                                                                              |
|----------------|----------------------------------------------------------------------------------------------------------|
| Cell Mode      | The cell format (UNI or NNI) that is used on the ATM interface (NNI is not supported on SONET/SDH ports) |
| Configured VCs | The number of configured VCs                                                                             |
| Configured VTs | The number of configured VTs                                                                             |

**Table 93 Show Port ATM Output Fields (Continued)**

| Label                  | Description                                                                                                                                                                                                                                         |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Configured minimum VPI | The configured minimum allowable VPI value that can be used on the ATM interface for a VPC                                                                                                                                                          |
| Last Unknown VPI/VCI   | The last unknown VPI/VCI that was received on this interface                                                                                                                                                                                        |
| Mapping                | Direct: direct ATM cell mapping is used                                                                                                                                                                                                             |
| Configured VPs         | The number of configured VPs                                                                                                                                                                                                                        |
| Configured IFCs        | The number of configured IFCs                                                                                                                                                                                                                       |
| TC Alarm State         | The ATM interface notifications indicating that the TC sublayer is currently in the Loss of Cell Delineation (LCD) defect maintenance state or that the TC sublayer is currently not in the Loss of Cell Delineation (LCD) defect maintenance state |
| HEC Errors (Dropped)   | The number of cells with uncorrectable HEC errors on this interface                                                                                                                                                                                 |
| Number OCD Events      | The number of times the Out of Cell Delineation (OCD) events occurred                                                                                                                                                                               |
| HEC Errors (Fixed)     | The number of cells with correctable HEC errors on this interface                                                                                                                                                                                   |
| Ingress CBR            | The total CBR bandwidth consumed on this interface in the ingress direction                                                                                                                                                                         |
| Ingress RT-VBR         | The total real-time variable bit rate (rt-VBR) bandwidth consumed on this interface in the ingress direction                                                                                                                                        |
| Ingress NRT-VBR        | The total non-real-time variable bit rate (nrt-VBR) bandwidth consumed on this interface in the ingress direction                                                                                                                                   |
| Ingress UBR            | The total unspecified bit rate (UBR) bandwidth consumed on this interface in the ingress direction                                                                                                                                                  |
| Egress CBR             | The total CBR bandwidth consumed on this interface in the egress direction                                                                                                                                                                          |
| Egress RT-VBR          | The total real-time variable bit rate (rt-VBR) bandwidth consumed on this interface in the egress direction                                                                                                                                         |
| Egress NRT-VBR         | The total non-real-time variable bit rate (nrt-VBR) bandwidth consumed on this interface in the egress direction                                                                                                                                    |

**Table 93 Show Port ATM Output Fields (Continued)**

| Label              | Description                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------|
| Egress UBR         | The total unspecified bit rate (UBR) bandwidth consumed on this interface in the egress direction |
| Ingress Total      | The total bandwidth of all service categories consumed on this interface in the ingress direction |
| Egress Total       | The total bandwidth of all service categories consumed on this interface in the egress direction  |
| ATM Link Bandwidth | The total ATM link bandwidth accepted on this interface                                           |
| Shaped Bandwidth   | The total shaped bandwidth consumed on this interface in the egress direction                     |

**Output Example**

```

A:ALU-1># show port 1/1/1.1 atm connections
=====
ATM Connections, Port 1/1/1.1
=====
 Owner Type Ing.TD Egr.TD Adm OAM Opr

0/100 SAP PVC 101 201 up up up
0/101 SAP PVC 101 201 up up up
0/102 SAP PVC 101 201 up up up
0/103 SAP PVC 101 201 up up up
0/104 SAP PVC 101 201 up up up
0/105 SAP PVC 101 201 up up up
0/106 SAP PVC 101 201 up up up
0/107 SAP PVC 101 201 up up up
0/108 SAP PVC 101 201 up up up
0/109 SAP PVC 101 201 up up up
0/110 SAP PVC 101 201 up up up
0/111 SAP PVC 101 201 up up up
0/112 SAP PVC 101 201 up up up
0/113 SAP PVC 101 201 up up up
0/114 SAP PVC 101 201 up up up
=====

```

**Table 94 Show Port ATM Connections Output Fields**

| Label   | Description                                                                                          |
|---------|------------------------------------------------------------------------------------------------------|
| Owner   | The system entity that owns a specific ATM connection                                                |
| Type    | The connection type                                                                                  |
| Ing. TD | The ATM traffic descriptor profile that applies to the receive direction of the interface connection |

**Table 94 Show Port ATM Connections Output Fields (Continued)**

| Label   | Description                                                                                                                                                                                              |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Egr. TD | The ATM traffic descriptor profile that applies to the transmit direction of the interface connection                                                                                                    |
| Adm     | The administrative state of the interface connection                                                                                                                                                     |
| OAM     | The OAM operational status of ATM connections:<br>Up: the interface is operationally up<br>ETE-AIS: the endpoint is down and is generating end-to-end AIS OAM cells to alert the far end that it is down |
| Opr     | The status of the ATM interface                                                                                                                                                                          |

**Output Example**

```
*A:ALU-1># show port 1/1/1.1 atm pvc
=====
ATM PVCs, Port 1/1/1.1
=====
VPI/VCI Owner Type Ing.TD Egr.TD Adm OAM Opr

0/32 SAP PVC 1 1 up ETE-AIS dn
=====
*A:ALU-1>
```

**Table 95 Show Port ATM PVC Output Fields**

| Label   | Description                                                                                                                                                                                              |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| VPI/VCI | The VPI/VCI values                                                                                                                                                                                       |
| Owner   | The system entity that owns a specific ATM connection                                                                                                                                                    |
| Type    | The connection type                                                                                                                                                                                      |
| Ing. TD | The ATM traffic descriptor profile that applies to the receive direction of the interface connection                                                                                                     |
| Egr. TD | The ATM traffic descriptor profile that applies to the transmit direction of the interface connection                                                                                                    |
| Adm     | The administrative state of the interface connection                                                                                                                                                     |
| OAM     | The OAM operational status of ATM connections:<br>Up: the interface is operationally up<br>ETE-AIS: the endpoint is down and is generating end-to-end AIS OAM cells to alert the far end that it is down |
| Opr     | The status of the ATM interface                                                                                                                                                                          |

**Output Example**

```
*A:ALU-1># show port 1/1/1.1 atm pvc 0/32
=====
ATM PVC
=====
Port Id : 1/1/1.1 VPI/VCI : 0/32
Admin State : up Oper state : down
OAM State : ETE-AIS Encap Type : n/a
Owner : SAP AAL Type : n/a
Endpoint Type : PVC Cast Type : P2P
Ing. Td Idx : 1 Egr. Td Idx : 1
Last Changed : 11/08/2007 17:02:36 ILMI Vpi/Vci Range : n/a
=====
*A:ALU-1>#
```

**Table 96** Show Port ATM PVC VPI/VCI Output Fields

| Label         | Description                                                                                                                                                                                              |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port Id       | The port ID configured or displayed in the <i>slot/mda/port</i> format                                                                                                                                   |
| VPI/VCI       | The VPI/VCI values                                                                                                                                                                                       |
| Admin State   | The administrative state of the interface connection                                                                                                                                                     |
| Oper State    | The status of the ATM interface                                                                                                                                                                          |
| OAM State     | The OAM operational status of ATM connections:<br>Up: the interface is operationally up<br>ETE-AIS: the endpoint is down and is generating end-to-end AIS OAM cells to alert the far end that it is down |
| Encap Type    | The encapsulation type                                                                                                                                                                                   |
| Owner         | The system entity that owns a specific ATM connection                                                                                                                                                    |
| Endpoint Type | The endpoint type                                                                                                                                                                                        |
| Cast Type     | The connection topology type                                                                                                                                                                             |
| Ing. TD Idx   | The ATM traffic descriptor profile that applies to the receive direction of the interface connection                                                                                                     |
| Egr. TD Idx   | The ATM traffic descriptor profile that applies to the transmit direction of the interface connection                                                                                                    |

**Output Example**

```

*A:ALU-1># show port 1/1/1.1 atm pvc 0/32 detail
=====
ATM PVC
=====
Port Id : 1/1/1.1 VPI/VCI : 0/32
Admin State : up Oper state : down
OAM State : up Encap Type : n/a
Owner : SAP AAL Type : n/a
Endpoint Type : PVC Cast Type : P2P
Ing. Td Idx : 1 Egr. Td Idx : 1
Last Changed : 11/08/2007 17:02:36 ILMI Vpi/Vci Range : n/a
=====

ATM Statistics
=====
 Input Output

Octets 1643 1643
Cells 31 31
CLP=0 Cells 31 31
Dropped CLP=0 Cells 0 0
Dropped Cells (CLP=0+1) 0 0
Tagged Cells 0
=====

ATM OAM Statistics
=====
 Input Output

Loopback 0 0
OAM Cells (generated) 0
=====

```

**Table 97 Show Port ATM PVC VPI/VCI Detail Output Fields**

| Label       | Description                                                                                                                                                                                              |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port Id     | The port ID configured or displayed in the <i>slot/mda/port</i> format                                                                                                                                   |
| VPI/VCI     | The VPI/VCI values                                                                                                                                                                                       |
| Admin State | The administrative state of the interface connection                                                                                                                                                     |
| Oper State  | The status of the ATM interface                                                                                                                                                                          |
| OAM State   | The OAM operational status of ATM connections:<br>Up: the interface is operationally up<br>ETE-AIS: the endpoint is down and is generating end-to-end AIS OAM cells to alert the far end that it is down |
| Encap Type  | The encapsulation type                                                                                                                                                                                   |

**Table 97 Show Port ATM PVC VPI/VCI Detail Output Fields (Continued)**

| Label                   | Description                                                                                                               |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------|
| Owner                   | Identifies the system entity that owns a specific ATM connection                                                          |
| AAL Type                | The ATM Adaptation Layer 5 (AAL5) information                                                                             |
| Endpoint Type           | The endpoint type                                                                                                         |
| Cast Type               | The connection topology type                                                                                              |
| Ing. Td Idx             | The ATM traffic descriptor profile that applies to the receive direction of the interface connection                      |
| Egr. Td Idx             | The ATM traffic descriptor profile that applies to the transmit direction of the interface connection                     |
| Last Changed            | The date and time that the interface connection entered its current operational state                                     |
| Octets                  | The number of input and output octets<br>HEC discarded cells are not included in the input octet numbers                  |
| Cells                   | The number of input and output cells<br>HEC discarded cells are not included in the input cell numbers                    |
| CLP=0 Cells             | The number of CLP=0 cells                                                                                                 |
| Dropped CLP=0 Cells     | The number of dropped CLP=0 cells                                                                                         |
| Dropped Cells (CLP=0+1) | The number of dropped CLP=0+1 cells                                                                                       |
| Tagged Cells            | The number of tagged cells                                                                                                |
| Loopback                | The number of loopback requests and responses transmitted and received on this connection for both end-to-end and segment |
| OAM Cells (generated)   | The number of OAM cells generated at the endpoint and sent towards the network                                            |

**Output Example**

```
*A:ALU-1># show port 1/1/1.1 atm pvp
=====
ATM PVPs, Port 1/1/1.1
=====
VPI Owner Type Ing.TD Egr.TD Adm OAM Opr

2 SAP PVP 1 1 up up up
=====
```



**Table 98 Show Port ATM PVP Output Fields**

| Label  | Description                                                                                                                                                                                              |
|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| VPI    | The VPI value                                                                                                                                                                                            |
| Owner  | The system entity that owns a specific ATM connection                                                                                                                                                    |
| Type   | The type of connection                                                                                                                                                                                   |
| Ing.TD | The ATM traffic descriptor profile that applies to the receive direction of the interface connection                                                                                                     |
| Egr.TD | The ATM traffic descriptor profile that applies to the transmit direction of the interface connection                                                                                                    |
| Adm    | Up: the interface is administratively up                                                                                                                                                                 |
|        | Down: the interface is administratively down                                                                                                                                                             |
| OAM    | The OAM operational status of ATM connections:<br>Up: the interface is operationally up<br>ETE-AIS: the endpoint is down and is generating end-to-end AIS OAM cells to alert the far end that it is down |
| Opr    | Up: the interface is operationally up                                                                                                                                                                    |
|        | Down: the interface is operationally down                                                                                                                                                                |

**Output Example**

```
*A:ALU-1>show port 1/1/1.1 atm pvp 11 detail
=====
ATM PVP
=====
Port Id : 1/1/1.1 VPI : 11
Admin State : up Oper state : up
OAM State : up
Owner : SAP
Endpoint Type : PVP Cast Type : P2P
Ing. Td Idx : 1 Egr. Td Idx : 1
Last Changed : 02/01/2000 00:37:25 ILMI Vpi Range : n/a
=====
ATM Statistics
=====
 Input Output

Octets 1007 1007
Cells 19 19
CLP=0 Cells 19 19
Dropped CLP=0 Cells 0 0
Dropped Cells (CLP=0+1) 0 0
Tagged Cells 0
=====
```

```

=====
ATM OAM Statistics
=====
 Input Output

Loopback 0 0
OAM Cells
(generated) 0
=====
*A:ALU-1>#

```

**Table 99**      **Show Port ATM PVP Detail Output Fields**

| Label         | Description                                                                                                                                                                                              |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port Id       | The port ID configured or displayed in the <i>slot/mda/port</i> format                                                                                                                                   |
| VPI           | The VPI values                                                                                                                                                                                           |
| Admin State   | The administrative state of the interface connection                                                                                                                                                     |
| Oper State    | The status of the ATM interface                                                                                                                                                                          |
| OAM State     | The OAM operational status of ATM connections:<br>Up: the interface is operationally up<br>ETE-AIS: the endpoint is down and is generating end-to-end AIS OAM cells to alert the far end that it is down |
| Owner         | The system entity that owns a specific ATM connection                                                                                                                                                    |
| Endpoint Type | The endpoint type                                                                                                                                                                                        |
| Cast Type     | The connection topology type                                                                                                                                                                             |
| Ing. Td Idx   | The ATM traffic descriptor profile that applies to the receive direction of the interface connection                                                                                                     |
| Egr. Td Idx   | The ATM traffic descriptor profile that applies to the transmit direction of the interface connection                                                                                                    |
| Last Changed  | The date and time that the interface connection entered its current operational state                                                                                                                    |
| Octets        | The number of input and output octets<br>HEC discarded cells are not included in the input octet numbers                                                                                                 |
| Cells         | The number of input and output cells<br>HEC discarded cells are not included in the input cell numbers                                                                                                   |
| CLP=0 Cells   | The number of CLP=0 cells                                                                                                                                                                                |

**Table 99 Show Port ATM PVP Detail Output Fields (Continued)**

| Label                   | Description                                                                                                               |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------|
| Dropped CLP=0 Cells     | The number of dropped CLP=0 cells                                                                                         |
| Dropped Cells (CLP=0+1) | The number of dropped CLP=0+1 cells                                                                                       |
| Tagged Cells            | The number of tagged cells                                                                                                |
| Loopback                | The number of loopback requests and responses transmitted and received on this connection for both end-to-end and segment |
| OAM Cells (generated)   | The number of OAM cells generated at the endpoint and sent towards the network                                            |

### 3.14.2.1.7 Show Port-tree Commands

#### port-tree

|                    |                                                                                                                  |
|--------------------|------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>port-tree</b> <i>port-id</i>                                                                                  |
| <b>Context</b>     | show                                                                                                             |
| <b>Description</b> | This command displays the tree for SONET/SDH ports or channels.                                                  |
| <b>Parameters</b>  | <i>port-id</i> — specifies the physical port ID                                                                  |
|                    | <b>Syntax</b> <i>slot[/mda[/port]]</i> or <i>slot/mda/port[.channel]</i>                                         |
| <b>Output</b>      | The following output is an example of port-tree information, and <a href="#">Table 100</a> describes the fields. |

#### Output Example

```
*A:ALU-A# show port-tree 1/5/1
ifIndex type, sonet-sdh-index (* = provisioned)
=====
 44072960 Port, N/A *
580943873 STS3, none
580943933 STS1, sts1-1
N/A VTG, 1.1
580943945 VT2, vt2-1.1.1
580943946 E1, 1.1.1
580943979 VT2, vt2-1.1.2
580943980 E1, 1.1.2
580944013 VT2, vt2-1.1.3
580944014 E1, 1.1.3

...
N/A VTG, 3.7
580946003 VT2, vt2-3.7.1
580946004 E1, 3.7.1
580946037 VT2, vt2-3.7.2
580946038 E1, 3.7.2
580946071 VT2, vt2-3.7.3
580946072 E1, 3.7.3
*A:ALU-A#
```

**Table 100 Show Port-tree Output Fields**

| Label           | Description                                                                            |
|-----------------|----------------------------------------------------------------------------------------|
| lflindex        | Displays the interface number of the index, which reflects its initialization sequence |
| type            | Specifies the OC3 bandwidth subdivision                                                |
| sonet-sdh-index | Specifies the sonet-sdh-index                                                          |
| *               | Indicates that the port or channel is provisioned                                      |

### 3.14.2.1.8 Show LAG Commands

## lag

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>lag</b> [ <i>lag-id</i> ] [ <b>detail</b> ] [ <b>statistics</b> ]<br><b>lag</b> <i>lag-id</i> <b>associations</b><br><b>lag</b> [ <i>lag-id</i> ] <b>description</b><br><b>lag</b> <i>lag-id</i> [ <b>detail</b> ] <b>lACP-partner</b><br><b>lag</b> [ <i>lag-id</i> ] <b>port</b>                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | show                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b> | <p>This command displays Link Aggregation Group (LAG) information.</p> <p>If no command line options are specified, a summary listing of all LAGs is displayed.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Parameters</b>  | <p><i>lag-id</i> — displays information only on the specified LAG</p> <p><b>Values</b> 1 to 32</p> <p><b>detail</b> — displays detailed LAG information</p> <p><b>Default</b> displays summary LAG information</p> <p><b>statistics</b> — displays LAG statistics information</p> <p><b>associations</b> — displays a list of current router interfaces to which the LAG is associated</p> <p><b>description</b> — displays a list of all LAGs and LAG ports and their descriptions</p> <p><b>lACP-partner</b> — displays information about the LACP partner (<b>detail</b> keyword provides detailed information)</p> <p><b>port</b> — displays information about the specified LAG port or all LAG ports</p> |
| <b>Output</b>      | <p>The following outputs are examples of LAG information:</p> <ul style="list-style-type: none"> <li>• Summary (<a href="#">Output Example, Table 101</a>)</li> <li>• Detail (<a href="#">Output Example, Table 102</a>)</li> <li>• Statistics (<a href="#">Output Example, Table 103</a>)</li> <li>• Associations (<a href="#">Output Example, Table 104</a>)</li> <li>• Description (<a href="#">Output Example, Table 105</a>)</li> <li>• LACP partner (<a href="#">Output Example, Table 106</a>)</li> <li>• LACP partner (detail) (<a href="#">Output Example, Table 107</a>)</li> <li>• Port (<a href="#">Output Example, Table 108</a>)</li> </ul>                                                      |

**Output Example**

```
*A:ALU-1># show lag
=====
Lag Data
=====
Lag-id Adm Opr Port-Threshold Up-Link-Count MC Act/Stdby

1 up down 0 0 N/A
2 up down 1 0 N/A
3 up up 0 1 N/A

Total Lag-ids: 3 Single Chassis: 3 MC Act: 0 MC Stdbby: 0
=====
*A:ALU-1>#
```

**Table 101 Show LAG Summary Output Fields**

| Label          | Description                                                                                      |
|----------------|--------------------------------------------------------------------------------------------------|
| Lag-id         | The LAG identifier                                                                               |
| Adm            | Up: the LAG is administratively up                                                               |
|                | Down: the LAG is administratively down                                                           |
| Opr            | Up: the LAG is operationally up                                                                  |
|                | Down: the LAG is operationally down                                                              |
| Port-Threshold | The number of operational links at or below which the LAG is considered to be operationally down |
| Up-Link-Count  | The number of ports that are physically present and have physical links present                  |
| MC Act/Stdby   | N/A                                                                                              |

**Output Example**

```
*A:ALU-1># show lag 2 detail
=====
LAG Details
=====
Description : LAG2

Details

Lag-id : 2 Mode : access
Adm : up Opr : down
Thres. Exceeded Cnt : 0 Port Threshold : 1
Thres. Last Cleared : 08/19/2011 14:35:28 Threshold Action : down
Dynamic Cost : false Encap Type : null
Configured Address : 04:68:ff:00:00:01 Lag-IfIndex : 1342177282
Hardware Address : a4:58:ff:00:01:42 Adapt Qos : N/A
Hold-time Down : 0.0 sec Port Type : standard
```

```

LACP : enabled Mode : active
LACP Transmit Intvl : fast LACP xmit stdby : enabled
Selection Criteria : highest-count Slave-to-partner : disabled
Number of sub-groups: 2 Forced : -
System Id : a4:58:ff:00:00:00 System Priority : 32768
Admin Key : 32769 Oper Key : 32769
Prtr System Id : Prtr System Priority : 0
Prtr Oper Key : 0

Port-id Adm Act/Stdby Opr Primary Sub-group Forced Prio

1/4/3 up active down yes 1 - 1
1/5/3 up standby down 2 - 2

Port-id Role Exp Def Dist Col Syn Aggr Timeout Activity

1/4/3 actor Yes Yes No No No Yes Yes Yes
1/4/3 partner Yes Yes No No No No Yes Yes No
1/5/3 actor Yes Yes No No No Yes Yes Yes
1/5/3 partner Yes Yes No No No No Yes Yes No
=====
*A:ALU-1>#

```

The following example displays LAG details with MC-LAG Output

```

*A:ALU-1># show lag 2 detail
=====
LAG Details
=====
Description : LAG2

Details

Lag-id : 2 Mode : access
Adm : up Opr : down
Thres. Exceeded Cnt : 0 Port Threshold : 1
Thres. Last Cleared : 08/19/2011 14:35:28 Threshold Action : down
Dynamic Cost : false Encap Type : null
Configured Address : 04:68:ff:00:00:01 Lag-Ifindex : 1342177282
Hardware Address : a4:58:ff:00:01:42 Adapt Qos : N/A
Hold-time Down : 0.0 sec Port Type : standard
LACP : enabled Mode : active
LACP Transmit Intvl : fast LACP xmit stdby : enabled
Selection Criteria : highest-count Slave-to-partner : disabled
Number of sub-groups: 2 Forced : -
System Id : a4:58:ff:00:00:00 System Priority : 32768
Admin Key : 32769 Oper Key : 32769
Prtr System Id : Prtr System Priority : 0
Prtr Oper Key : 0

MC Peer Address : 10.10.10.4 MC Peer Lag-id : 1
MC System ID : 11.11.11.11:11:11 MC System Priority : 3
MC Admin Key : 12 MC Active/Standby : active
MC Lacp ID in use : true MC extended timeout : false
MC Selection Logic : peer timed out, selected local subgroup
MC Config Mismatch : no mismatch

Port-id Adm Act/Stdby Opr Primary Sub-group Forced Prio

```



```

1/4/3 up active down yes 1 - 1
1/5/3 up standby down yes 2 - 2

Port-id Role Exp Def Dist Col Syn Aggr Timeout Activity

1/4/3 actor Yes Yes No No No Yes Yes Yes
1/4/3 partner Yes Yes No No No No Yes No
1/5/3 actor Yes Yes No No No Yes Yes Yes
1/5/3 partner Yes Yes No No No No Yes No
=====
*A:ALU-1>#

```

**Table 102** Show LAG Detailed Output Fields

| Label               | Description                                                                                 |
|---------------------|---------------------------------------------------------------------------------------------|
| Lag-id              | The LAG identifier                                                                          |
| Mode                | The mode of the LAG: access or network                                                      |
| Adm                 | Up: the LAG is administratively up                                                          |
|                     | Down: the LAG is administratively down                                                      |
| Opr                 | Up: the LAG is operationally up                                                             |
|                     | Down: the LAG is operationally down                                                         |
| Thres. Exceeded Cnt | The number of times that the drop count was reached                                         |
| Port Threshold      | The number of operational links at or below which the LAG is regarded as operationally down |
| Thres. Last Cleared | The last time that keepalive statistics were cleared                                        |
| Threshold Action    | Action to take when the number of operational links is equal to or below the port threshold |
| Dynamic Cost        | n/a                                                                                         |
| Encap Type          | The encapsulation method used to distinguish customer traffic on a LAG                      |
| Configured Address  | The base chassis Ethernet MAC address                                                       |
| Lag-IfIndex         | A unique number assigned to this interface                                                  |
| Hardware Address    | The hardware address                                                                        |
| Adapt Qos           | The configured QoS mode                                                                     |
| Hold-time Down      | The hold-time, in tenths of seconds, before a failure is reported to higher levels          |
| Port Type           | Standard: standard Ethernet port types are supported                                        |

**Table 102 Show LAG Detailed Output Fields (Continued)**

| Label                | Description                                                      |
|----------------------|------------------------------------------------------------------|
| LACP                 | Enabled: LACP is enabled                                         |
|                      | Disabled: LACP is disabled                                       |
| Mode                 | Active: LACP operates in active mode                             |
|                      | Passive: LACP operates in passive mode                           |
| Role                 | Actor: local device (7705 SAR) participating in LACP negotiation |
|                      | Partner: remote device participating in LACP negotiation         |
| LACP Transmit Intvl  | LACP timeout signaled to peer                                    |
| LACP xmit stdby      | LACP transmit on standby links enabled or disabled               |
| Selection Criteria   | Configured subgroup selection criteria                           |
| Slave-to-partner     | Slave-to-partner flag enabled or disabled                        |
| Number of sub-groups | Total subgroups in LAG                                           |
| Forced               | n/a                                                              |
| System Id            | System ID used by actor in LACP messages                         |
| System Priority      | System priority used by actor in LACP messages                   |
| Admin Key            | Configured LAG key                                               |
| Oper Key             | Key used by actor in LACP messages                               |
| Prtr System Id       | System ID used by partner in LACP messages                       |
| Prtr System Priority | System priority used by partner in LACP messages                 |
| Prtr Oper Key        | Key used by partner in LACP messages                             |
| MC Peer Address      | IP address of the MC-LAG peer                                    |
| MC Peer Lag-id       | The LAG identifier of the MC-LAG peer                            |
| MC System Id         | System ID used by the MC-LAG actor in LACP messages              |
| MC System Priority   | System priority used by the MC-LAG actor in LACP messages        |
| MC Admin Key         | Configured MC-LAG key                                            |
| MC Active/Standby    | Indicates whether the port is in active or standby mode          |

**Table 102 Show LAG Detailed Output Fields (Continued)**

| Label               | Description                                                                                                                 |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------|
| MC Lacp ID in use   | Indicates whether MC-LAG values such as system-id, system priority, and lacp-key are advertised to the LACP peer            |
| MC extended timeout | Indicates whether the system is using a larger value than the value configured as the MC-LAG hold-on-neighbor-failure value |
| MC Selection Logic  | The current state of the MC-LAG protocol, indicating which of the two MC-LAG redundancy systems is the master               |
| MC Config Mismatch  | Indicates whether there is a LAG configuration mismatch between redundancy systems, and what is mismatched                  |
| Port-id             | The member physical port ID expressed in <i>slot/mda/port</i> format                                                        |
| Adm                 | Up: the member port is administratively up                                                                                  |
|                     | Down: the member port is administratively down                                                                              |
| Act/Stdby           | Active: the member port is active                                                                                           |
|                     | Standby: the member port is on standby                                                                                      |
| Opr                 | Up: the member port is operationally up                                                                                     |
|                     | Down: the member port is operationally down                                                                                 |
| Primary             | Indicates whether the member port is the primary port                                                                       |
| Sub-group           | The member port subgroup                                                                                                    |
| Prio                | The member port priority                                                                                                    |

**Output Example**

```
*A:ALU-1># show lag 2 statistics
=====
LAG Statistics
=====
Description : LAG2
Port-id Input Input Output Output Input Output
 Bytes Packets Bytes Packets Errors Errors

1/4/3 0 9968 0 9833 0 0
1/5/3 0 435 0 401 0 0

Totals 0 10403 0 10234 0 0
=====
*A:ALU-1>#
```

**Table 103 Show LAG Statistics Output Fields**

| Label          | Description                                                                                                                                                                                                                  |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port-id        | The member physical port ID expressed in <i>slot/mda/port</i> format                                                                                                                                                         |
| Input Bytes    | The number of inbound bytes for the LAG on a per-port basis                                                                                                                                                                  |
| Input Packets  | The number of inbound packets for the LAG on a per-port basis                                                                                                                                                                |
| Output Bytes   | The number of outbound bytes for the LAG on a per-port basis                                                                                                                                                                 |
| Output Packets | The number of outbound packets for the LAG on a per-port basis                                                                                                                                                               |
| Input Errors   | The number of inbound packets (for packet-oriented interfaces) or inbound transmission units (for character-oriented or fixed-length interfaces) that contained errors preventing them from being delivered to higher layers |
| Output Errors  | The number of outbound packets (for packet-oriented interfaces) or outbound transmission units (for character-oriented or fixed-length interfaces) that could not be transmitted because of errors                           |

**Output Example**

```

*A:ALU-1># show lag 1 associations
=====
Interface Table
=====
Router/ServiceId Name Encap Val

Router: Base ies-337-30.30.30.1 104

Interfaces
=====
*A:ALU-1>#

```

**Table 104 Show LAG Associations Output Fields**

| Label            | Description                         |
|------------------|-------------------------------------|
| Router/ServiceId | The service associated with the LAG |
| Name             | The name of the IP interface        |

**Table 104 Show LAG Associations Output Fields (Continued)**

| Label     | Description                                               |
|-----------|-----------------------------------------------------------|
| Encap Val | The dot1q or qinq values of the port for the IP interface |

**Output Example**

```

*A:ALU-1># show lag description
=====
Lag Port States
LACP Status: e - Enabled, d - Disabled
=====
Lag-id Port-id Adm Act/Stdby Opr Description

1 (e)
 1/1/7 up standby down 10/100/Gig Ethernet SFP
 1/6/1 up active down 10/100/Gig Ethernet SFP
2 (e)
 1/6/3 up active down 10/100/Gig Ethernet SFP
 1/7/3 up standby down 10/100/Gig Ethernet SFP
=====
*A:ALU-1>#

```

**Table 105 Show LAG Description Output Fields**

| Label                  | Description                                                       |
|------------------------|-------------------------------------------------------------------|
| <b>Lag Port States</b> |                                                                   |
| LACP Status            | Indicates whether LACP is enabled or disabled                     |
| Lag-id                 | The LAG identifier and LACP status code                           |
| Port-id                | The member physical port ID                                       |
| Adm                    | Indicates the administrative state of the member port: up or down |
| Act/Stdby              | Indicates whether the port is in active or standby mode           |
| Opr                    | Indicates the operational state of the member port: up or down    |
| Description            | The description strings configured for the LAG and member ports   |

**Output Example**

```

*A:ALU-1># show lag 1 lacp-partner
=====
LAG Partner information
=====
Partner system ID : ea:3e:ff:00:00:00
Partner system priority : 32768
Partner operational key : 2
=====
LAG 1 Ports Partner operational information
=====
Port Actor Port Prio Key
 port

1/1/7 33863 33864 5 2
1/6/1 34177 34178 7 2
=====
LAG 1 Ports Partner operational state information
=====
Port Exp Def Dist Col Syn Aggr Time Act
 out

1/1/7 No No Yes Yes Yes Yes Yes Yes
1/6/1 No No Yes Yes Yes Yes Yes Yes
=====
*A:ALU-1>#

```

**Table 106 Show LAG LACP Partner Output Fields**

| Label                                              | Description                                                   |
|----------------------------------------------------|---------------------------------------------------------------|
| <b>LAG Partner information</b>                     |                                                               |
| Partner system ID                                  | The system ID of the partner (remote device)                  |
| Partner system priority                            | The system priority used by the partner in LACP messages      |
| Partner operational key                            | The key used by the partner in LACP messages                  |
| <b>LAG 1 Ports Partner operational information</b> |                                                               |
| Port                                               | The member physical port ID                                   |
| Actor port                                         | The actor (local device) port associated with the member port |
| Port                                               | The partner port associated with the member port              |
| Prio                                               | The partner port priority associated with the member port     |
| Key                                                | The partner operational key associated with the member port   |

**Table 106 Show LAG LACP Partner Output Fields (Continued)**

| Label                                                    | Description                                                                                                                                                                                                                                                                                               |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>LAG 1 Ports Partner operational state information</b> |                                                                                                                                                                                                                                                                                                           |
| Port                                                     | The member physical port ID                                                                                                                                                                                                                                                                               |
| Exp                                                      | (Expired) – indicates whether the partner is in the Expired state; if Yes, the LAG is not operational                                                                                                                                                                                                     |
| Def                                                      | (Default) – indicates whether the partner information (system priority, key, port priority, and state of the partner) is the default information that is configured administratively or is information received through LACPDU. Default partner information is used if LACPDUs were not received on time. |
| Dist                                                     | (Distributing) – indicates whether the distribution of outgoing frames is enabled or disabled on the link                                                                                                                                                                                                 |
| Col                                                      | (Collecting) – indicates whether the collection of incoming frames is enabled or disabled on the link                                                                                                                                                                                                     |
| Syn                                                      | (Synchronization) – indicates whether the link is allocated to the correct LAG                                                                                                                                                                                                                            |
| Aggr                                                     | (Aggregation) – indicates whether link aggregation is enabled or disabled on the port                                                                                                                                                                                                                     |
| Time out                                                 | Indicates whether a timeout value is set for the port                                                                                                                                                                                                                                                     |
| Act                                                      | (Activity) – indicates whether the link is active (port can send and receive LACPDU messages) or passive (port does not initiate LACP messages but will respond to LACP messages)                                                                                                                         |

**Output Example**

```
*A:ALU-1># show lag 1 detail lacp-partner
=====
LAG Partner information
=====
Partner system ID : de:41:ff:00:00:00
Partner system priority : 32768
Partner operational key : 32768
=====

LAG port 1/1/7 partner information

Actor port : 33863
Partner admin system prio : 32768
Partner oper system prio : 32768
Partner admin system ID : 00:00:00:00:00:00
Partner oper system ID : de:41:ff:00:00:00
```

```

Partner admin key : 0
Partner oper key : 32768
Partner admin port : (Not Specified)
Partner oper port : 33864
Partner admin port prio : 32768
Partner oper port prio : 32768
Partner admin state : (Not Specified)
Partner oper state : lacp-timeout, aggregation synchronization
 : collecting distributing

LAG port 1/6/1 partner information

Actor port : 34177
Partner admin system prio : 32768
Partner oper system prio : 32768
Partner admin system ID : 00:00:00:00:00:00
Partner oper system ID : de:41:ff:00:00:00
Partner admin key : 0
Partner oper key : 32768
Partner admin port : (Not Specified)
Partner oper port : 34178
Partner admin port prio : 32768
Partner oper port prio : 32768
Partner admin state : (Not Specified)
Partner oper state : lacp-timeout, aggregation synchronization
 : collecting distributing

*A:ALU-1>#

```

**Table 107** Show LAG Detailed LACP Partner Output Fields

| Label                                              | Description                                                                |
|----------------------------------------------------|----------------------------------------------------------------------------|
| <b>LAG Partner information</b>                     |                                                                            |
| Partner system ID                                  | The system ID of the partner (remote device)                               |
| Partner system priority                            | The system priority used by the partner in LACP messages                   |
| Partner operational key                            | The key used by the partner in LACP messages                               |
| <b>LAG port <i>port-id</i> partner information</b> |                                                                            |
| Actor port                                         | The actor (local device) port associated with the member port              |
| Partner admin system prio                          | The partner administrative system priority associated with the member port |
| Partner oper system prio                           | The partner operational system priority associated with the member port    |
| Partner admin system ID                            | The partner administrative system ID associated with the member port       |



**Table 107 Show LAG Detailed LACP Partner Output Fields (Continued)**

| Label                   | Description                                                              |
|-------------------------|--------------------------------------------------------------------------|
| Partner oper system ID  | The partner operational system ID associated with the member port        |
| Partner admin key       | The partner administrative key associated with the member port           |
| Partner oper key        | The partner operational key associated with the member port              |
| Partner admin port      | The partner administrative port associated with the member port          |
| Partner oper port       | The partner operational port associated with the member port             |
| Partner admin port prio | The partner administrative port priority associated with the member port |
| Partner oper port prio  | The partner operational port priority associated with the member port    |
| Partner admin state     | The administrative state of the partner                                  |
| Partner oper state      | The operational state of the partner                                     |

**Output Example**

```

*A:ALU-1># show lag 1 port
=====
Lag Port States
LACP Status: e - Enabled, d - Disabled
=====
Lag-id Port-id Adm Act/Stdbby Opr Primary Sub-group Forced Priority

1(e) 1/1/7 up standby down yes 2 - 32768
 1/6/1 up active down 1 - 32768
=====
*A:ALU-1>#

```

**Table 108 Show LAG Port Output Fields**

| Label                  | Description                                   |
|------------------------|-----------------------------------------------|
| <b>Lag Port States</b> |                                               |
| LACP status            | Indicates whether LACP is enabled or disabled |
| Lag-id                 | The LAG identifier and LACP status code       |
| Port-id                | The member physical port ID                   |

**Table 108**      **Show LAG Port Output Fields (Continued)**

| Label     | Description                                                       |
|-----------|-------------------------------------------------------------------|
| Adm       | Indicates the administrative state of the member port: up or down |
| Act/Stdby | Indicates whether the member port is in active or standby mode    |
| Opr       | Indicates the operational state of the member port: up or down    |
| Primary   | Indicates whether the member port is the primary port             |
| Sub-group | The member port sub-group                                         |
| Forced    | n/a                                                               |
| Priority  | The member port priority                                          |

### 3.14.2.1.9 Show Multilink Bundle and IMA Group Commands

#### multilink-bundle

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>multilink-bundle</b> [ <i>bundle-id</i>   <i>slot/mda</i>   <b>type</b> { <b>mlppp</b>   <b>ima-grp</b> }] [ <b>detail</b> ]<br><b>multilink-bundle</b> [{ <i>bundle-id</i>   <i>slot/mda</i> }   [ <b>ppp</b> [ <b>multiclass</b> ]   <b>ima</b> ]]                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | show                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | <p>This command displays multilink bundle information. An operator can display:</p> <ul style="list-style-type: none"> <li>• all bundles on the system/adaptor card or all bundles of a given type on the system by specifying the value of type filter to be either mlppp or ima-grp</li> <li>• bundle-specific information in summary (no detail option) or detailed format (detail option specified) for one or more bundles</li> <li>• protocol-specific information (for example, PPP or IMA) for the specified bundle</li> </ul>                                                                                                                                                          |
| <b>Parameters</b>  | <p><i>bundle-id</i> — the multilink (PPP or IMA) bundle identifier. The command syntax must be used as follows:</p> <p><b>Syntax:</b> <i>bundle-type-slot/mda.bundle-num</i></p> <p>bundle-ppp-slot/mda.bundle-num (a multilink PPP bundle)</p> <p>bundle-ima-slot/mda.bundle-num (an IMA group bundle)</p> <p>bundle: keyword</p> <p><i>slot</i>: MDA slot numbers</p> <p><i>bundle-num</i>: 1 to 32</p> <p><b>ppp</b> — displays PPP bundle information</p> <p><b>ppp multiclass</b> — displays multi-class MLPPP information</p> <p><b>ima, ima-grp</b> — displays IMA-type groups</p> <p><b>mlppp</b> — displays MLPPP-type groups</p> <p><b>detail</b> — provides detailed information</p> |
| <b>Output</b>      | <p>The following outputs are examples of multilink bundle information:</p> <ul style="list-style-type: none"> <li>• Multilink Bundle (<a href="#">Output Example, Table 109</a>)</li> <li>• Multilink Bundle IMA Group (<a href="#">Output Example, Table 110</a>)</li> <li>• Multilink Bundle IMA Group Detailed (<a href="#">Output Example, Table 111</a>)</li> <li>• Multilink Bundle MLPPP (<a href="#">Output Example, Table 112</a>)</li> <li>• Multilink Bundle Multi-class (<a href="#">Output Example, Table 112</a>)</li> <li>• Multilink Bundle MLPPP Detail (<a href="#">Output Example, Table 113</a>)</li> </ul>                                                                 |

**Output Example**

```

*A:ALU-1># show multilink-bundle
=====
Bundle Summary
=====
Bundle Type Admin Oper Port Min Total/
Id State State State State Links Active Links

bundle-ppp-1/1.1 mlppp Down Down Ghost 1 0/0
bundle-ppp-1/4.8 mlppp Up Down Ghost 1 0/0
bundle-ima-1/6.3 ima-grp Down Down Ghost 1 0/0

Bundles : 3
=====
*A:ALU-1>

```

**Table 109 Show Multilink Bundle Output Fields**

| Label       | Description                                                                                                      |
|-------------|------------------------------------------------------------------------------------------------------------------|
| Bundle Id   | The port ID for this bundle                                                                                      |
| Type        | The type of this multilink bundle:<br>mlppp: the bundle is of type MLPPP<br>ima: the bundle is of type IMA group |
| Admin State | Up: the bundle is administratively up                                                                            |
|             | Down: the bundle is administratively down                                                                        |
| Oper State  | Up: the bundle is operationally up                                                                               |
|             | Down: the bundle is operationally down                                                                           |

**Table 109 Show Multilink Bundle Output Fields (Continued)**

| Label        | Description                                                                                                                                                                                                                                                               |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port State   | The state level of the port:<br>none: the port is either in its initial creation state or is just about to be deleted                                                                                                                                                     |
|              | ghost: no member links are configured as part of this bundle                                                                                                                                                                                                              |
|              | down: all member links are in “none”, “ghost”, or “down” state                                                                                                                                                                                                            |
|              | linkUp: at least one member link is in port state “link up” but the bundle protocol is not yet operationally up (due to the bundle protocol still coming up; for example, due to insufficient number of member links in “link up” state yet or to bundle being shut down) |
|              | Up: the bundle is ready to pass some kinds of traffic as the bundle protocol has come up (at least “minimum links” member links are in the port state up and the bundle protocol is up)                                                                                   |
| Min Links    | The minimum number of links that must be active for a bundle to be active. If the number of links drop below the given minimum, then the multilink bundle will transition to an operation down state.                                                                     |
| Total Links  | The total number active of member links configured for this bundle                                                                                                                                                                                                        |
| Active Links | The total number of active links for the bundle                                                                                                                                                                                                                           |

**Output Example**

```

*A:ALU-1># show multilink-bundle type ima-grp
=====
Bundle Summary
=====
Bundle Type Admin Oper Port Min Total/
Id State State State State Links Active Links

bundle-ima-1/6.3 ima-grp Down Down Ghost 1 0/0

Bundles : 1
=====
*A:ALU-1>#
*A:ALU-1># show multilink-bundle bundle-ima-1/6.3
=====
Bundle Summary
=====
Bundle Type Admin Oper Port Min Total/

```

```

Id State State State Links Active Links

bundle-ima-1/6.3 ima-grp Down Down Ghost 1 0/0

Bundles : 1
=====
*A:ALU-1>

```



**Note:** The **ima-grp** command shows all bundles in the IMA group. The **bundle-ima** command shows information on the specified bundle. The fields for both commands are the same.

**Table 110 Show Multilink Bundle IMA Group Output Fields**

| Label       | Description                                                                                                                                                                                                                                                               |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bundle Id   | The port ID for this bundle                                                                                                                                                                                                                                               |
| Type        | The type of this multilink bundle:<br>ima: the bundle is of type IMA group                                                                                                                                                                                                |
| Admin State | Up: the bundle is administratively up                                                                                                                                                                                                                                     |
|             | Down: the bundle is administratively down                                                                                                                                                                                                                                 |
| Oper State  | Up: the bundle is operationally up                                                                                                                                                                                                                                        |
|             | Down: the bundle is operationally down                                                                                                                                                                                                                                    |
| Port State  | The state level of the port:<br>none: the port is either in its initial creation state or is just about to be deleted                                                                                                                                                     |
|             | ghost: no member links are configured as part of this bundle                                                                                                                                                                                                              |
|             | down: all member links are in “none”, “ghost”, or “down” state                                                                                                                                                                                                            |
|             | linkUp: at least one member link is in port state “link up” but the bundle protocol is not yet operationally up (due to the bundle protocol still coming up; for example, due to insufficient number of member links in “link up” state yet or to bundle being shut down) |
|             | Up: the bundle is ready to pass some kinds of traffic as the bundle protocol has come up (at least “minimum links” member links are in the port state up and the bundle protocol is up)                                                                                   |

**Table 110 Show Multilink Bundle IMA Group Output Fields (Continued)**

| Label        | Description                                                                                                                                                                                           |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Min Links    | The minimum number of links that must be active for a bundle to be active. If the number of links drop below the given minimum, then the multilink bundle will transition to an operation down state. |
| Total Links  | The total number active of member links configured for this bundle                                                                                                                                    |
| Active Links | The total number of active links for the bundle                                                                                                                                                       |
| Bundles      | The number of bundles on the port                                                                                                                                                                     |

**Output Example**

```

*A:ALU-1># show multilink-bundle type ima-grp detail
=====
Bundle bundle-ima-1/6.3 Detail
=====
Description : MultiLink Bundle
Bundle Id : bundle-ima-1/6.3 Type : ima-grp
Admin Status : down Oper Status : down
Minimum Links : 1 Bundle IfIndex : 583012355
Total Links : 0 Active Links : 0
Red Diff Delay : 25 Yellow Diff Delay : N/A
Red Diff Delay Act : down MRRU : N/A
Short Sequence : N/A Oper MRRU : N/A
Oper MTU : 1524 Fragment Threshold : 128 bytes
Up Time : N/A Bandwidth : 0 KBit
PPP Input Discards : N/A Primary Member Port: None
Mode : access
=====
Traffic Statistics
=====
 Input Output

Octets 0 0
Packets 0 0
Errors 0 0
=====
Port Statistics
=====
 Input Output

Unicast Packets 0 0
Multicast Packets 0 0
Broadcast Packets 0 0
Discards 0 0
Unknown Proto Discards 0
=====
*A:ALU-1>
*A:ALU-1># show multilink-bundle bundle-ima-1/6.3 detail
=====
Bundle bundle-ima-1/6.3 Detail

```

```

=====
Description : MultiLink Bundle
Bundle Id : bundle-ima-1/6.3 Type : ima-grp
Admin Status : down Oper Status : down
Minimum Links : 1 Bundle IfIndex : 583012355
Total Links : 0 Active Links : 0
Red Diff Delay : 25 Yellow Diff Delay : N/A
Red Diff Delay Act : down MRRU : N/A
Short Sequence : N/A Oper MRRU : N/A
Oper MTU : 1524 Fragment Threshold : 128 bytes
Up Time : N/A Bandwidth : 0 KBit
PPP Input Discards : N/A Primary Member Port: None
Mode : access
=====

Traffic Statistics
=====
 Input Output

Octets 0 0
Packets 0 0
Errors 0 0
=====

Port Statistics
=====
 Input Output

Unicast Packets 0 0
Multicast Packets 0 0
Broadcast Packets 0 0
Discards 0 0
Unknown Proto Discards 0 0
=====
*A:ALU-1>

```



**Note:** The **ima-grp detail** command shows all bundles in the IMA group. The **bundle-ima detail** command shows information on the specified bundle. The fields for both commands are the same.

**Table 111** Show Multilink Bundle IMA Group Detailed Output Fields

| Label         | Description                                                                                                                                                                                           |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Description   | The configured description for this bundle                                                                                                                                                            |
| Bundle Id     | The port ID for this bundle                                                                                                                                                                           |
| Admin Status  | Up: the bundle is administratively up                                                                                                                                                                 |
|               | Down: the bundle is administratively down                                                                                                                                                             |
| Minimum Links | The minimum number of links that must be active for a bundle to be active. If the number of links drop below the given minimum, then the multilink bundle will transition to an operation down state. |



**Table 111 Show Multilink Bundle IMA Group Detailed Output Fields**

| Label                     | Description                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Total Links               | The total number of active member links configured for this bundle                                                                                                                                                                                                                                                                                                              |
| Red Diff Delay            | The maximum acceptable differential delay for individual circuits within this multilink bundle. If the delay exceeds this threshold, a trap is issued.                                                                                                                                                                                                                          |
| Red Diff Delay Act        | The action that will be taken on the IMA group once the Red Diff Delay is exceeded                                                                                                                                                                                                                                                                                              |
| Oper MTU                  | The negotiated size of the largest packet that can be sent on the port or channel, specified in octets                                                                                                                                                                                                                                                                          |
| Mode                      | network: the port is configured for transport network use                                                                                                                                                                                                                                                                                                                       |
|                           | access: the port is configured for service access                                                                                                                                                                                                                                                                                                                               |
| Type                      | Indicates that this bundle is of type IMA group                                                                                                                                                                                                                                                                                                                                 |
| Oper Status               | The operational port status of a member link                                                                                                                                                                                                                                                                                                                                    |
| Bundle IfIndex            | The bundle's interface index number, which reflects its initialization sequence                                                                                                                                                                                                                                                                                                 |
| Active Links              | The total number of active links for the bundle                                                                                                                                                                                                                                                                                                                                 |
| Bandwidth                 | The bandwidth configured for this IMA group bundle in kb/s                                                                                                                                                                                                                                                                                                                      |
| <b>Traffic Statistics</b> |                                                                                                                                                                                                                                                                                                                                                                                 |
| Octets Input/Output       | The total number of octets received and transmitted on the port                                                                                                                                                                                                                                                                                                                 |
| Packets Input/Output      | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent. |

**Table 111 Show Multilink Bundle IMA Group Detailed Output Fields**

| Label                          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Errors Input/Output            | <p>For packet-oriented interfaces, the number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol. For character-oriented or fixed-length interfaces, the number of inbound transmission units that contained errors preventing them from being deliverable to a higher-layer protocol.</p> <p>For packet-oriented interfaces, the number of outbound packets that could not be transmitted because of errors. For character-oriented or fixed-length interfaces, the number of outbound transmission units that could not be transmitted because of errors.</p> |
| <b>Port Statistics</b>         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Unicast packets Input/Output   | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                                                                                                         |
| Multicast packets Input/Output | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a unicast or broadcast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                                                                                                             |
| Broadcast packets Input/Output | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or multicast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a unicast or multicast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                                                                                                             |
| Discards Input/Output          | The number of inbound/outbound packets chosen to be discarded to possibly free up buffer space                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

**Table 111 Show Multilink Bundle IMA Group Detailed Output Fields**

| Label                                  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Unknown proto discards<br>Input/Output | For packet-oriented interfaces, the number of packets received via the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received via the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0. Unknown proto discards do not show up in the packet counts. |

**Output Example**

```

*A:ALU-1># show multilink-bundle type mlppp
=====
Bundle Summary
=====
Bundle Type Admin Oper Port Min Total/
Id State State State State Links Active Links

bundle-ppp-1/1.1 mlppp Down Down Ghost 1 0/0
bundle-ppp-1/4.8 mlppp Up Down Ghost 1 0/0

Bundles : 2
=====
*A:ALU-1>#

*A:ALU-1># show multilink-bundle bundle-ppp-1/4.8
=====
Bundle Summary
=====
Bundle Type Admin Oper Port Min Total/
Id State State State State Links Active Links

bundle-ppp-1/4.8 mlppp Up Down Ghost 1 0/0

Bundles : 1
=====
*A:ALU-1>#

A:ALU-1# show multilink-bundle bundle-ppp-1/1.13 ppp multiclass
=====
MLPPP Per Class Traffic Statistics for bundle-ppp-1/1.13
=====
 Input Output

Class 0
 Octets 2993101300 2993220860
 Packets 3054185 3054307
 Errors 0 0
Class 1
 Octets 2987258540 2993219880

```

```

Packets 3048223 3054306
Errors 0 0
Class 2
Octets 2987255600 2993220860
Packets 3048220 3054307
Errors 0 0
Class 3
Octets 2987257560 2993220860
Packets 3048222 3054307
Errors 0 0
=====

```



**Note:** The **mlppp** command shows all bundles in the MLPPP group. The **bundle-ppp** command shows information on the specified bundle. The fields for both commands are the same.

**Table 112 Show Multilink Bundle MLPPP Output Fields**

| Label       | Description                                                                                                                                                                                                                                                                          |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bundle Id   | The port ID for this bundle                                                                                                                                                                                                                                                          |
| Type        | The type of this multilink bundle:<br>mlppp: the bundle is of type MLPPP                                                                                                                                                                                                             |
| Admin State | Up: the bundle is administratively up                                                                                                                                                                                                                                                |
|             | Down: the bundle is administratively down                                                                                                                                                                                                                                            |
| Oper State  | Up: the bundle is operationally up                                                                                                                                                                                                                                                   |
|             | Down: the bundle is operationally down                                                                                                                                                                                                                                               |
| Port State  | The state level of the port:<br>none: the port is either in its initial creation state or is just about to be deleted                                                                                                                                                                |
|             | ghost: no member links are configured as part of this bundle                                                                                                                                                                                                                         |
|             | down: all member links are in the “none”, “ghost”, or “down” state                                                                                                                                                                                                                   |
|             | linkUp: at least one member link is in the port state “link up” but the bundle protocol is not yet operationally up (due to the bundle protocol still coming up; for example, due to an insufficient number of member links in the “link up” state or to the bundle being shut down) |
|             | Up: the bundle is ready to pass some kinds of traffic as the bundle protocol has come up (at least “minimum links” member links are in the port state up and the bundle protocol is up)                                                                                              |

**Table 112 Show Multilink Bundle MLPPP Output Fields (Continued)**

| Label                | Description                                                                                                                                                                                            |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Min Links            | The minimum number of links that must be active for a bundle to be active. If the number of links drops below the given minimum, then the multilink bundle will transition to an operation down state. |
| Total Links          | The total number of active member links configured for this bundle                                                                                                                                     |
| Active Links         | The total number of active links for the bundle                                                                                                                                                        |
| Bundles              | Number of bundles on the port                                                                                                                                                                          |
| Class                | The MC-MLPPP service class                                                                                                                                                                             |
| Octets Input/Output  | The total number of octets received and transmitted on the port                                                                                                                                        |
| Packets Input/Output | The total number of packets received and transmitted on the port                                                                                                                                       |
| Errors Input/Output  | The number of packets that contained errors preventing them from being deliverable                                                                                                                     |

**Output Example**

```

*A:ALU-1># show multilink-bundle type mlppp detail
=====
Bundle bundle-ppp-1/1.1 Detail
=====
Description : MultiLink Bundle
Bundle Id : bundle-ppp-1/1.1 Type : mlppp
Admin Status : down Oper Status : down
Minimum Links : 1 Bundle IfIndex : 572522497
Total Links : 0 Active Links : 0
Red Diff Delay : 0 Yellow Diff Delay : 0
Red Diff Delay Act : none MRRU : 1524
Short Sequence : false Oper MRRU : 1524
Oper MTU : 1526 Fragment Threshold : 128 bytes
Up Time : N/A Bandwidth : 0 KBit
PPP Input Discards : 0 Primary Member Port: None
Mode : network Net. Egr. Queue Pol:
=====
Traffic Statistics
=====
 Input Output

Octets 0 0
Packets 0 0
Errors 0 0
=====
Port Statistics
=====
 Input Output

Unicast Packets 0 0
Multicast Packets 0 0

```

```

Broadcast Packets 0 0
Discards 0 0
Unknown Proto Discards 0
=====

*A:ALU-1># show multilink-bundle bundle-ppp-1/4.8 detail
=====
Bundle bundle-ppp-1/4.8 Detail
=====
Description : MultiLink Bundle
Bundle Id : bundle-ppp-1/4.8 Type : mlppp
Admin Status : up Oper Status : down
Minimum Links : 1 Bundle IfIndex : 578813960
Total Links : 0 Active Links : 0
Red Diff Delay : 0 Yellow Diff Delay : 0
Red Diff Delay Act : none MRRU : 1524
Short Sequence : false Oper MRRU : 1524
Oper MTU : 1526 Fragment Threshold : 128 bytes
Up Time : N/A Bandwidth : 0 KBit
PPP Input Discards : 0 Primary Member Port: None
Mode : network Net. Egr. Queue Pol:
=====
Traffic Statistics
=====
 Input Output

Octets 0 0
Packets 0 0
Errors 0 0
=====
Port Statistics
=====
 Input Output

Unicast Packets 0 0
Multicast Packets 0 0
Broadcast Packets 0 0
Discards 0 0
Unknown Proto Discards 0
=====
*A:ALU-1>#

```



**Note:** The **mlppp detail** command shows all bundles in the MLPPP group. The **bundle-ppp detail** command shows information on the specified bundle. The fields for both commands are the same.

**Table 113** Show Multilink Bundle MLPPP Detail Fields

| Label       | Description                                |
|-------------|--------------------------------------------|
| Description | The configured description for this bundle |
| Bundle Id   | The port ID for this bundle                |

**Table 113 Show Multilink Bundle MLPPP Detail Fields (Continued)**

| Label              | Description                                                                                                                                                                                           |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Admin Status       | Up: the bundle is administratively up                                                                                                                                                                 |
|                    | Down: the bundle is administratively down                                                                                                                                                             |
| Minimum Links      | The minimum number of links that must be active for a bundle to be active. If the number of links drop below the given minimum, then the multilink bundle will transition to an operation down state. |
| Total Links        | The total number of active member links configured for this bundle                                                                                                                                    |
| Red Diff Delay     | The maximum acceptable differential delay for individual circuits within this multilink bundle. If the delay exceeds this threshold, a trap is issued.                                                |
| Red Diff Delay Act | The action that will be taken on the MLPPP bundle once the Red Diff Delay is exceeded                                                                                                                 |
| Short Sequence     | Indicates whether the MLPPP bundle uses short (12 bit) sequence numbers instead of the default 24-bit sequence number                                                                                 |
| Oper MTU           | The negotiated size of the largest packet that can be sent on the port or channel, specified in octets                                                                                                |
| Mode               | network: the port is configured for transport network use                                                                                                                                             |
|                    | access: the port is configured for service access                                                                                                                                                     |
| Type               | The bundle type                                                                                                                                                                                       |
| Oper Status        | The operational port status of a member link                                                                                                                                                          |
| Bundle IfIndex     | The bundle's interface index number, which reflects its initialization sequence                                                                                                                       |
| Active Links       | The total number of active links for the bundle                                                                                                                                                       |
| Yellow Diff Delay  | The yellow warning threshold for the differential delay for members within a multilink bundle                                                                                                         |
| MRRU               | The configured maximum frame size that can be reconstructed from multilink fragments                                                                                                                  |
| Oper MRRU          | The operating maximum frame size that can be reconstructed from multilink fragments                                                                                                                   |
| Bandwidth          | The bandwidth configured for this MLPPP bundle in kb/s                                                                                                                                                |

**Table 113 Show Multilink Bundle MLPPP Detail Fields (Continued)**

| Label                          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Traffic and Port statistics    | The traffic and port statistics information displayed for bundles when the detail option is selected is the same as information displayed for physical ports                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Traffic Statistics</b>      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Octets Input/Output            | The total number of octets received and transmitted on the port                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Packets Input/Output           | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                                                                                                         |
| Errors Input/Output            | <p>For packet-oriented interfaces, the number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol. For character-oriented or fixed-length interfaces, the number of inbound transmission units that contained errors preventing them from being deliverable to a higher-layer protocol.</p> <p>For packet-oriented interfaces, the number of outbound packets that could not be transmitted because of errors. For character-oriented or fixed-length interfaces, the number of outbound transmission units that could not be transmitted because of errors.</p> |
| <b>Port Statistics</b>         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Unicast packets Input/Output   | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                                                                                                         |
| Multicast packets Input/Output | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a unicast or broadcast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                                                                                                             |



**Table 113 Show Multilink Bundle MLPPP Detail Fields (Continued)**

| Label                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Broadcast packets Input/Output      | The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or multicast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a unicast or multicast address at this sublayer, including those that were discarded or not sent.                                                                                                                                                        |
| Discards Input/Output               | The number of inbound/outbound packets chosen to be discarded to possibly free up buffer space                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Unknown proto discards Input/Output | For packet-oriented interfaces, the number of packets received via the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received via the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0. Unknown proto discards do not show up in the packet counts. |

### 3.14.2.1.10 Show ATM IMA Group Commands

#### multilink-bundle

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>multilink-bundle</b> <i>bundle-id</i> <b>ima atm</b> [ <b>detail</b> ]<br><b>multilink-bundle</b> <i>bundle-id</i> <b>ima atm connections</b><br><b>multilink-bundle</b> <i>bundle-id</i> <b>ima atm pvc</b> [ <i>vpi/vci</i> ] [ <b>detail</b> ]<br><b>multilink-bundle</b> <i>bundle-id</i> <b>ima atm pvp</b> [ <i>vpi</i> ] [ <b>detail</b> ]                                                                                                    |
| <b>Context</b>     | show                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b> | This command displays ATM port information for IMA group bundles. The information displayed is equivalent to that displayed for the show port (atm) command.                                                                                                                                                                                                                                                                                            |
| <b>Parameters</b>  | <i>bundle-id</i> — specifies the IMA port ID<br><b>atm</b> — displays ATM information<br><b>connections</b> — displays ATM connection information<br><b>pvc</b> — displays ATM port PVC information<br><b>pvp</b> — displays ATM port PVP information<br><i>vpi/vci</i> — displays the VPI/VCI values<br><b>Values</b> vpi: 0 to 4095 (NNI)<br>0 to 255<br>vci: 1, 2, 5 to 65534<br><b>detail</b> — provides detailed information                       |
| <b>Output</b>      | The following outputs are examples of IMA ATM information: <ul style="list-style-type: none"> <li>• Multilink Bundle IMA ATM (<a href="#">Output Example, Table 114</a>)</li> <li>• Multilink Bundle IMA ATM Connections (<a href="#">Output Example, Table 115</a>)</li> <li>• Multilink Bundle IMA ATM PVC (<a href="#">Output Example, Table 116</a>)</li> <li>• Multilink Bundle IMA ATM PVP (<a href="#">Output Example, Table 117</a>)</li> </ul> |

#### Output Example

```
*A:ALU-1># show multilink-bundle bundle-ima-1/6.3 ima atm
=====
ATM Info for bundle-ima-1/6.3
=====
Cell Mode : UNI Mapping : n/a
Configured VCs : 0 Configured VPs : 0
Configured VTs : 0 Configured IFCs : 0
Configured minimum VPI: 0
Last Unknown VPI/VCI : none
=====
```

**Table 114 Show Multilink Bundle IMA ATM Output Fields**

| Label                  | Description                                                    |
|------------------------|----------------------------------------------------------------|
| Cell Mode              | The cell format (UNI or NNI) that is used on the ATM interface |
| Configured VCs         | The number of configured VCs                                   |
| Configured VTs         | The number of configured VTs                                   |
| Configured minimum VPI | The minimum VPI configured for this bundle                     |
| Last Unknown VPI/VCI   | The last unknown VPI/VCI that was received on this interface   |
| Configured VPs         | The number of configured VPs                                   |

**Output Example**

```
*A:ALU-1># show multilink-bundle bundle-ima-1/6.3 ima atm connections
=====
ATM Connections, Port bundle-ima-1/6.3
=====
 Owner Type Ing.TD Egr.TD Adm OAM Opr

1/100 SAP PVC 2 2 up up up
=====
*A:ALU-1>#
```

**Table 115 Show Multilink Bundle IMA ATM Connections Output Fields**

| Label  | Description                                                                                                   |
|--------|---------------------------------------------------------------------------------------------------------------|
| Owner  | The system entity that owns a specific ATM connection                                                         |
| Type   | The type of connection                                                                                        |
| Ing.TD | The ATM traffic descriptor profile that applies to the receive direction of the interface connection          |
| Egr.TD | The ATM traffic descriptor profile that applies to the transmit direction of the interface connection         |
| Adm    | Up: the bundle is administratively up                                                                         |
|        | Down: the bundle is administratively down                                                                     |
| OAM    | The OAM operational status of ATM connections:<br>Up: the interface is operationally up                       |
|        | ETE-AIS: the endpoint is down and is generating end-to-end AIS OAM cells to alert the far end that it is down |

**Table 115 Show Multilink Bundle IMA ATM Connections Output Fields**

| Label | Description                            |
|-------|----------------------------------------|
| Opr   | Up: the bundle is operationally up     |
|       | Down: the bundle is operationally down |

**Output Example**

```

*A:ALU-1># show multilink-bundle bundle-ima-1/6.3 ima atm pvc
=====
ATM PVCs, Port bundle-ima-1/6.3
=====
VPI/VCI Owner Type Ing.TD Egr.TD Adm OAM Opr

1/100 SAP PVC 2 2 up up up
=====
*A:ALU-1>#

*A:ALU-1># show multilink-bundle bundle-ima-1/6.3 ima atm pvc detail
=====
ATM PVCs, Port bundle-ima-1/6.3
=====
VPI/VCI Owner Type Ing.TD Egr.TD Adm OAM Opr

1/100 SAP PVC 2 2 up up up
=====
ATM Statistics
=====
 Input Output

Octets 0 0
Cells 0 0
=====
AAL-5 Packet Statistics
=====
 Input Output

Packets 0 0
Dropped Packets 0 0
CRC-32 Errors 0
Reassembly Timeouts 0
Over Sized SDUs 0
=====
ATM OAM Statistics
=====
 Input Output

Loopback 0 0
OAM Cells
(generated) 0
=====
*A:ALU-1>#

```

**Table 116 Show Multilink Bundle IMA ATM PVC Output Fields**

| Label   | Description                                                                                                   |
|---------|---------------------------------------------------------------------------------------------------------------|
| VPI/VCI | The VPI/VCI value                                                                                             |
| Owner   | The system entity that owns a specific ATM connection                                                         |
| Type    | The type of connection                                                                                        |
| Ing.TD  | The ATM traffic descriptor profile that applies to the receive direction of the interface connection          |
| Egr.TD  | The ATM traffic descriptor profile that applies to the transmit direction of the interface connection         |
| Adm     | Up: the bundle is administratively up                                                                         |
|         | Down: the bundle is administratively down                                                                     |
| OAM     | The OAM operational status of ATM connections:<br>Up: the interface is operationally up                       |
|         | ETE-AIS: the endpoint is down and is generating end-to-end AIS OAM cells to alert the far end that it is down |
| Opr     | Up: the bundle is operationally up                                                                            |
|         | Down: the bundle is operationally down                                                                        |

**Output Example**

```

*A:ALU-1># show multilink-bundle bundle-ima-1/6.3 ima atm pvp
=====
ATM PVPs, Port bundle-ima-1/6.3
=====
VPI Owner Type Ing.TD Egr.TD Adm OAM Opr

2 SAP PVP 1 1 up up up
=====
*A:ALU-1>#

```

**Table 117 Show Multilink-bundle IMA ATM PVP Output Fields**

| Label  | Description                                                                                                   |
|--------|---------------------------------------------------------------------------------------------------------------|
| VPI    | The VPI value                                                                                                 |
| Owner  | The system entity that owns a specific ATM connection                                                         |
| Type   | The type of connection                                                                                        |
| Ing.TD | The ATM traffic descriptor profile that applies to the receive direction of the interface connection          |
| Egr.TD | The ATM traffic descriptor profile that applies to the transmit direction of the interface connection         |
| Adm    | up: the bundle is administratively up                                                                         |
|        | down: the bundle is administratively down                                                                     |
| OAM    | The OAM operational status of ATM connections:<br>Up: the interface is operationally up                       |
|        | ETE-AIS: the endpoint is down and is generating end-to-end AIS OAM cells to alert the far end that it is down |
| Opr    | up: the bundle is operationally up                                                                            |
|        | down: the bundle is operationally down                                                                        |

### 3.14.2.1.11 Show SCADA Commands

#### scada

**Syntax**     **scada** [*bridge\_id*] [**detail**]  
**scada** [*bridge\_id*] **description**  
**scada** [*bridge\_id*] [**detail**] **statistics**

**Context**     show

**Description**     This command displays SCADA bridge information.

**Parameters**     **detail** — displays detailed information  
*bridge-id* — specifies the bridge ID, in the format *slot/mda/bridge-id*, where *bridge-id* is 1 to 16  
**description** — displays the descriptions that have been configured for each bridge  
**statistics** — displays statistics information pertaining to bridges and branches

**Output**     The following outputs are examples of SCADA information:

- SCADA bridge detail ([Output Example, Table 118](#))
- specific SCADA bridge detail ([Output Example, Table 119](#))

#### Output Example

```
A:ALU-1># show scada detail
=====
Scada Bridges on Slot 1
=====
```

| Bridge Id | Admin State | Link State | Bridge State | Port Mode | Port Encp | Bridge Type | Branch Type |
|-----------|-------------|------------|--------------|-----------|-----------|-------------|-------------|
| 1/8/1     | Up          | Yes        | Up           | accs      | cem       | mddb        | master      |
| 1/8/1.1   | Up          | Yes        | Up           | accs      | cem       | mddb        | master      |
| 1/8/1.2   | Up          | Yes        | Up           | accs      | cem       | mddb        | slave       |
| 1/8/1.3   | Up          | Yes        | Up           | accs      | cem       | mddb        | slave       |
| 1/8/1.4   | Up          | Yes        | Up           | accs      | cem       | mddb        | slave       |
| 1/8/1.5   | Up          | Yes        | Up           | accs      | cem       | mddb        | slave       |
| 1/8/2     | Down        | No         | Down         |           |           |             |             |
| 1/8/3     | Down        | No         | Down         |           |           |             |             |
| 1/8/4     | Down        | No         | Down         |           |           |             |             |
| 1/8/5     | Down        | No         | Down         |           |           |             |             |
| 1/8/6     | Down        | No         | Down         |           |           |             |             |
| 1/8/6.5   | Down        | No         | Down         | accs      | cem       | mddb        | slave       |
| 1/8/7     | Down        | No         | Down         |           |           |             |             |
| 1/8/8     | Down        | No         | Down         |           |           |             |             |
| 1/8/8.4   | Down        | No         | Down         | accs      | cem       | mddb        | slave       |
| 1/8/8.5   | Down        | No         | Down         | accs      | cem       | mddb        | slave       |
| 1/8/8.6   | Down        | No         | Down         | accs      | cem       | mddb        | slave       |
| 1/8/9     | Down        | No         | Down         |           |           |             |             |
| 1/8/10    | Down        | No         | Down         |           |           |             |             |

```

1/8/10.10 Down No Down accs cem mddb slave
1/8/11 Down No Down
1/8/11.11 Down No Down accs cem mddb slave
1/8/11.22 Down No Down accs cem mddb slave
1/8/12 Down No Down
1/8/13 Down No Down
1/8/14 Down No Down
1/8/14.14 Down No Down accs cem mddb slave
1/8/15 Down No Down
1/8/16 Down No Down
1/8/16.32 Down No Down accs cem mddb slave
=====

```

**Table 118 Show SCADA Bridge Detail Output Fields**

| Label                          | Description                                                                                                                                                                                                                 |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Scada Bridges on Slot 1</b> |                                                                                                                                                                                                                             |
| Bridge Id                      | The bridge/branch ID (the bridge ID is in the format <i>slot/mda/bridge-id</i> , where <i>bridge-id</i> is 1 to 16; the branch ID is in the format <i>slot/mda/bridge-id.branch-id</i> , where <i>branch-id</i> is 1 to 32) |
| Admin State                    | The administrative state of the bridge, either Up or Down                                                                                                                                                                   |
| Link                           | Indicates whether there is an active link on the bridge, either Yes or No                                                                                                                                                   |
| Bridge State                   | The operational state of the bridge, either Up or Down                                                                                                                                                                      |
| Port Mode                      | The operational mode of the bridge (always accs – access)                                                                                                                                                                   |
| Port Encp                      | The encapsulation type of the bridge (always cem – circuit emulation)                                                                                                                                                       |
| Bridge Type                    | The bridge type: mddb, pcm, or vcb                                                                                                                                                                                          |
| Branch Type                    | The type of device connected to the bridge, either master or slave (for MDDB and PCM applications) or N/A (for the VCB application)                                                                                         |



**Output Example**

```

A:ALU-1># show scada 1/8/14 detail
=====
Scada Info
=====
Description : SCADA bridge 14
Bridge Id : 1/8/14 Type : Mddb
Admin Status : down Oper Status : down
Squelch : enabled Squelch Timeout : 120(s)
Squelch Recovery : manual Recovery Timeout : N/A
Squelch Status : 0x0 Force-active : 1
Redundant Mode : manual
Report Alarms : hcmOof hcmRai Speed : 2400
=====
Bridge Members

Identifier Multidrop AdminState OperState AlarmStatus Squelched

1/8/14.14 slave up down N/A N
=====
Scada Bridge Statistics
=====

Input Output

Packets 0 0
Discards 0 0
Unknown Proto Discards 0
=====

```

**Table 119 Show Specific SCADA Bridge Detail Output Fields**

| Label             | Description                                                                               |
|-------------------|-------------------------------------------------------------------------------------------|
| <b>Scada Info</b> |                                                                                           |
| Description       | The description configured for the bridge                                                 |
| Bridge Id         | The bridge ID in the format <i>slot/mda/bridge-id</i> , where <i>bridge-id</i> is 1 to 16 |
| Type              | The bridge type: Mddb, pcm, or vcb                                                        |
| Admin Status      | The administrative state of the bridge, either up or down                                 |
| Oper Status       | The operational state of the bridge, either up or down                                    |
| Squelch           | Indicates whether the squelch function has been enabled (applies only to MDDB and PCM)    |
| Squelch Timeout   | The configured squelch timeout (applies only to MDDB and PCM)                             |
| Squelch Recovery  | The squelch recovery mode: manual or auto (applies only to MDDB and PCM)                  |

**Table 119 Show Specific SCADA Bridge Detail Output Fields (Continued)**

| Label                          | Description                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Recovery Timeout               | The configured time after which the branch will automatically be put back in the normal state (applies only to MDDB and PCM)<br>Applicable only if recovery mode is auto; if recovery mode is manual, the field displays N/A                                                                                                                                                                           |
| Squelch Status                 | The bitmap (32 bits) of the branches that are squelched (applies only to MDDB and PCM). A value of 0x0 means that no branch is squelched.                                                                                                                                                                                                                                                              |
| Force-active                   | The master branch (1 or 2) to which the <b>force-active</b> command has been applied (applies only to MDDB and PCM)                                                                                                                                                                                                                                                                                    |
| Redundant Mode                 | The redundancy mode for the master inputs: manual or auto (applies only to MDDB and PCM)                                                                                                                                                                                                                                                                                                               |
| Report Alarms                  | The configured type of alarms to be reported to the bridge (applies only to MDDB)                                                                                                                                                                                                                                                                                                                      |
| Speed                          | The configured speed of the bridge (applies only to MDDB)                                                                                                                                                                                                                                                                                                                                              |
| <b>Bridge Members</b>          |                                                                                                                                                                                                                                                                                                                                                                                                        |
| Identifier                     | The branch ID in the format <i>bridge-id.branch-id</i> , where <i>bridge-id</i> is 1 to 16 and <i>branch-id</i> is 1 to 32                                                                                                                                                                                                                                                                             |
| Multidrop                      | The type of device connected to the bridge, either master or slave (applies only to MDDB and PCM)                                                                                                                                                                                                                                                                                                      |
| AdminState                     | The administrative state of the branch, either up or down                                                                                                                                                                                                                                                                                                                                              |
| OperState                      | The operational state of the branch, either up or down                                                                                                                                                                                                                                                                                                                                                 |
| AlarmStatus                    | The current alarm state of the branch                                                                                                                                                                                                                                                                                                                                                                  |
| Squelched                      | Indicates whether the squelch function has been enabled                                                                                                                                                                                                                                                                                                                                                |
| <b>Scada Bridge Statistics</b> |                                                                                                                                                                                                                                                                                                                                                                                                        |
| Packets Input/Output           | The total number of packets that were delivered by this sublayer to a higher (sub) layer and that were not addressed to a multicast or broadcast address at this sublayer<br><br>The total number of packets that higher-level protocols requested to be transmitted and that were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent |

**Table 119 Show Specific SCADA Bridge Detail Output Fields (Continued)**

| Label                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Discards Input/Output               | The number of inbound/outbound packets chosen to be discarded to possibly free up buffer space                                                                                                                                                                                                                                                                                                                                                                       |
| Unknown Proto Discards Input/Output | For packet-oriented interfaces, the number of packets received at the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received at the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0. |

---

### 3.14.2.2 Monitor Commands

- [Port Monitor Commands](#)
- [Fabric Profile Statistics Monitor Commands](#)
- [SCADA Monitor Commands](#)

### 3.14.2.2.1 Port Monitor Commands

## port

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>port</b> <i>port-id</i> [ <i>port-id...</i> (up to 5 total)] [ <b>interval</b> <i>seconds</i> ] [ <b>repeat</b> <i>repeat</i> ] [ <b>absolute</b>   <b>rate</b> ] [ <b>multiclass</b> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Context</b>     | monitor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | <p>This command enables port traffic monitoring. The specified ports' statistical information is shown at the configured interval until the configured count is reached.</p> <p>The first screen displays the current statistics related to the specified ports. The subsequent statistical information listed for each interval is displayed as a delta to the previous screen.</p> <p>When the keyword <b>rate</b> is specified, the "rate per second" for each statistic is displayed instead of the delta.</p> <p>Monitor commands are similar to show commands, but only statistical information is shown. Monitor commands display the selected statistics according to the configured number of times at the interval specified.</p>                                                                                                                                                                                                                                                                                                                                                             |
| <b>Parameters</b>  | <p><i>port-id</i> — specifies up to 5 port IDs</p> <p style="padding-left: 40px;"><b>Syntax</b> <i>port-id</i>    <i>slot[/mda[/port]]</i> or <i>slot/mda/port[.channel]</i><br/> <i>bundle-id</i>: <i>bundle-type-slot/mda.bundle-num</i><br/> <b>bundle</b> keyword<br/> <i>bundle-num</i>: 1 to 32<br/> <i>type</i> ima, ppp</p> <p><i>seconds</i> — configures the interval for each display in seconds</p> <p style="padding-left: 40px;"><b>Values</b>        3 to 60<br/> <b>Default</b>        10</p> <p><i>repeat</i> — configures how many times the command is repeated</p> <p style="padding-left: 40px;"><b>Values</b>        1 to 999<br/> <b>Default</b>        10</p> <p><b>absolute</b> — when the <b>absolute</b> keyword is specified, the raw statistics are displayed without processing. No calculations are performed on the delta or rate statistics.</p> <p><b>rate</b> — when the <b>rate</b> keyword is specified, the rate per second for each statistic is displayed instead of the delta</p> <p><b>multiclass</b> — displays statistics for multi-class MLPPP bundles</p> |
| <b>Output</b>      | The following outputs are examples of port monitoring information.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

**Output Example**

```

*A:ALU-1# monitor port 1/1/1.1 interval 3 repeat 3 absolute
=====
Monitor statistics for Port 1/1/1.1
=====
 Input Output

At time t = 0 sec (Base Statistics)

Octets 330161274 330161274
Packets 6229458 6229458
Errors 0 0

At time t = 3 sec (Mode: Absolute)

Octets 330162917 330162917
Packets 6229489 6229489
Errors 0 0

At time t = 6 sec (Mode: Absolute)

Octets 330164560 330164560
Packets 6229520 6229520
Errors 0 0

At time t = 9 sec (Mode: Absolute)

Octets 330166203 330166203
Packets 6229551 6229551
Errors 0 0
=====
*A:ALU-1#
A:ALU-1# monitor port bundle-ppp-1/1.13 interval 5 repeat 2 rate multiclass
=====
Monitor multiclass statistics for Bundle bundle-ppp-1/1.13
=====
 Input Output

At time t = 0 sec (Base Statistics)

Class 0
 Octets 2990779680 2990899240
 Packets 3051816 3051938
 Errors 0 0
Class 1
 Octets 2984941820 2990898260
 Packets 3045859 3051937
 Errors 0 0
Class 2
 Octets 2984939860 2990899240
 Packets 3045857 3051938
 Errors 0 0

```

```

Class 3
 Octets 2984940840 2990899240
 Packets 3045858 3051938
 Errors 0 0

At time t = 5 sec (Mode: Rate)

Class 0
 Octets 9408 9408
 Packets 10 10
 Errors 0 0
Utilization (% of port capacity) 1.89 1.89
Class 1
 Octets 9408 9408
 Packets 10 10
 Errors 0 0
Utilization (% of port capacity) 1.89 1.89
Class 2
 Octets 9212 9408
 Packets 9 10
 Errors 0 0
Utilization (% of port capacity) 1.85 1.89
Class 3
 Octets 9408 9408
 Packets 10 10
 Errors 0 0
Utilization (% of port capacity) 1.89 1.89

At time t = 10 sec (Mode: Rate)

Class 0
 Octets 9408 9408
 Packets 10 10
 Errors 0 0
Utilization (% of port capacity) 1.89 1.89
Class 1
 Octets 9408 9408
 Packets 10 10
 Errors 0 0
Utilization (% of port capacity) 1.89 1.89
Class 2
 Octets 9408 9408
 Packets 10 10
 Errors 0 0
Utilization (% of port capacity) 1.89 1.89
Class 3
 Octets 9212 9408
 Packets 9 10
 Errors 0 0
Utilization (% of port capacity) 1.85 1.89
=====
A:ALU-1#

```

port

**Syntax** `port port-id atm [interval seconds] [repeat repeat] [absolute | rate]`

**Context** monitor

**Description** This command enables ATM port traffic monitoring.

**Parameters** *port-id* — specifies the physical port ID

**Syntax** *port-id* `slot[/mda[/port]]` or `slot/mda/port[.channel]`  
*bundle-id*: `bundle-type-slot/mda.bundle-num`  
**bundle** keyword  
*bundle-num*: 1 to 32  
*type* ima, ppp

*seconds* — configures the interval for each display in seconds

**Values** 3 to 60  
**Default** 10

*repeat* — configures how many times the command is repeated

**Values** 1 to 999  
**Default** 10

**absolute** — when the **absolute** keyword is specified, the raw statistics are displayed without processing. No calculations are performed on the delta or rate statistics.

**rate** — when the **rate** keyword is specified, the rate per second for each statistic is displayed instead of the delta

**Output** The following output is an example of ATM port monitoring information.

Output Example

```
*A:ALU-1# monitor port 1/1/1.1 atm interval 3 repeat 3 absolute
=====
Monitor ATM statistics for Port 1/1/1.1
=====
 Input Output

At time t = 0 sec (Base Statistics)

Octets 330260861 330260861
Cells 6231337 6231337
Unknown VPI/VCI Cells 0

At time t = 3 sec (Mode: Absolute)

Octets 330262504 330262504
Cells 6231368 6231368
```



---

```
Unknown VPI/VCI Cells 0

At time t = 6 sec (Mode: Absolute)

Octets 330264147 330264147
Cells 6231399 6231399
Unknown VPI/VCI Cells 0

At time t = 9 sec (Mode: Absolute)

Octets 330265790 330265790
Cells 6231430 6231430
Unknown VPI/VCI Cells 0
=====
*A:ALU-1#
```

3.14.2.2.2 Fabric Profile Statistics Monitor Commands

fabric-profile

|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Syntax      | <b>fabric-profile mda</b> { <i>mda-id</i>   <b>with-stats-enabled</b> } { <b>dest-mda</b>   <b>source-mda</b> } [ <b>interval</b> <i>seconds</i> ] [ <b>repeat</b> <i>repeat</i> ] [ <b>absolute</b>   <b>rate</b> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Context     | monitor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Description | This command enables monitoring of adapter card fabric profile statistics. The specified adapter card statistical information displays and automatically refreshes at the configured interval.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Parameters  | <p><i>mda-id</i> — the slot number of the adapter card</p> <p><b>with-stats-enabled</b> — if used, this keyword replaces the <i>mda-id</i> parameter, in which case the adapter card that has <b>fabric-stats-enabled</b> configured will be the one which is monitored; that is, the command will be <b>monitor fabric-profile mda with-stats-enabled dest-mda   source-mda</b>. If there are no adapter cards that have <b>fabric-stats-enabled</b> configured, no statistics will be displayed.</p> <p><b>dest-mda</b> — displays network and access ingress statistics for all adapter cards going towards the fabric and destined for the specific destination adapter card. The following are also displayed: global fabric statistics, fabric firewall statistics, and the fabric port statistics if the destination adapter card has the collection of fabric statistics enabled. The sum of traffic forwarded or dropped is also displayed.</p> <p><b>source-mda</b> — displays network and access ingress traffic statistics from the specified adapter card going towards the fabric and towards a destination adapter card. Fabric firewall statistics and the sum of traffic forwarded or dropped are also displayed.</p> <p><i>seconds</i> — configures the interval for each display in seconds</p> <p><b>Values</b> 3 to 60</p> <p><b>Default</b> 10</p> <p><i>repeat</i> — configures how many times the command is repeated</p> <p><b>Values</b> 1 to 999</p> <p><b>Default</b> 10</p> <p><b>absolute</b> — displays the raw statistics without processing. No calculations are performed on the delta or rate statistics.</p> <p><b>rate</b> — displays the rate per second for each statistic instead of the delta</p> |

### 3.14.2.2.3 SCADA Monitor Commands

#### scada

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>scada</b> <i>scada-id</i> [ <i>scada-id...</i> (up to 5 total)] [ <b>interval</b> <i>seconds</i> ] [ <b>repeat</b> <i>repeat</i> ] [ <b>absolute</b>   <b>rate</b> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | monitor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b> | <p>This command enables traffic monitoring for a SCADA bridge or branch. The statistical information for the specified bridge or branch is shown at the configured interval until the configured count is reached.</p> <p>The first screen displays the current statistics related to the specified bridge or branch. The subsequent statistical information listed for each interval is displayed as a delta to the previous screen.</p> <p>When the keyword <b>rate</b> is specified, the “rate per second” for each statistic is displayed instead of the delta.</p> <p>Monitor commands are similar to show commands, but only statistical information is shown. Monitor commands display the selected statistics according to the configured number of times at the interval specified.</p>                                                                                                                                                                                                                                 |
| <b>Parameters</b>  | <p><i>scada-id</i> — specifies a <i>bridge-id</i> or a <i>branch-id</i>. For a <i>bridge-id</i>, the format is <i>slot/mda/bridge-id</i>, where <i>bridge-id</i> is 1 to 16. For a <i>branch-id</i>, the format is <i>slot/mda/bridge-id.branch-id</i>, where <i>bridge-id</i> is 1 to 16 and <i>branch-id</i> is 1 to 32. Up to five <i>scada-ids</i> can be specified.</p> <p><i>seconds</i> — configures the interval for each display in seconds</p> <p><b>Values</b>      3 to 60</p> <p><b>Default</b>     10</p> <p><i>repeat</i> — configures how many times the command is repeated</p> <p><b>Values</b>      1 to 999</p> <p><b>Default</b>     10</p> <p><b>absolute</b> — when the <b>absolute</b> keyword is specified, the raw statistics are displayed without processing. No calculations are performed on the delta or rate statistics.</p> <p><b>rate</b> — when the <b>rate</b> keyword is specified, the rate per second for each statistic is displayed instead of the delta; the default mode is delta</p> |

### 3.14.2.3 Clear Commands

#### external-alarms

|                    |                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>external-alarms alarm</b> [ <b>all</b>   <i>alarm-id</i> ]                                             |
| <b>Context</b>     | clear                                                                                                     |
| <b>Description</b> | This command clears remote site external alarm information.                                               |
| <b>Parameters</b>  | <b>all</b> — clears the status for all alarms<br><i>alarm-id</i> — clears the status for a specific alarm |
| <b>Values</b>      | 1 to 2147483647                                                                                           |

#### lag

|                    |                                                                                 |
|--------------------|---------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>lag</b> <i>lag-id</i> <b>statistics</b>                                      |
| <b>Context</b>     | clear                                                                           |
| <b>Description</b> | This command clears statistics for the specified LAG.                           |
| <b>Parameters</b>  | <i>lag-id</i> — the LAG identifier, expressed as a decimal integer              |
| <b>Values</b>      | 1 to 32                                                                         |
|                    | <b>statistics</b> — specifies that statistics are cleared for the specified LAG |

#### mda

|                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>  | <b>mda</b> <i>mda-id</i><br><b>mda</b> <i>mda-id</i> <b>statistics</b> { <b>source-mda</b>   <b>destination-mda</b>   <b>fabric-port</b>   <b>fabric-global</b>   <b>fabric-firewall</b>   <b>all</b> }<br><b>mda</b> <i>mda-id</i> <b>ring</b> { <b>all</b>   <b>mac</b> <i>ieee-address</i>   <b>port</b> <i>port-id</i> }<br><b>mda</b> <i>mda-id</i> <b>statistics ip-transport</b><br><b>mda</b> <i>mda-id</i> <b>statistics security</b> [ <b>encryption</b>   <b>firewall</b> ]<br><b>mda</b> <i>mda-id</i> <b>statistics mirror</b><br><b>mda all</b> |
| <b>Context</b> | clear                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

---

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b> | The <b>clear mda</b> form of this command reinitializes the specified adapter card or DSL module and clears all the collected fabric statistics related to the card or module. The <b>clear mda statistics</b> form of this command clears all the collected fabric statistics related to the specified adapter card or DSL module. The <b>clear mda ring</b> form of this command clears the dynamic FDB entries related to the specified ring adapter card.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Parameters</b>  | <p><i>mda-id</i> — the slot number of the specified adapter card or DSL module</p> <p><b>statistics</b> — specifies that fabric statistics will be cleared for the specified adapter card or DSL module</p> <p><b>source-mds</b> — clears all the network and access ingress traffic statistics in the fabric direction from the specified adapter card towards all other destination adapter cards</p> <p><b>destination-mds</b> — clears all the network and access ingress traffic statistics towards the specified adapter card fabric port, from all other adapter cards</p> <p><b>fabric-port</b> — clears the fabric port statistics towards the specified destination adapter card, if the specified adapter card has <a href="#">fabric-stats-enabled</a>. If the specified adapter card does not have <a href="#">fabric-stats-enabled</a>, no statistics will be cleared.</p> <p><b>fabric-global</b> — clears global fabric statistics collected for all egress traffic from the fabric</p> <p><b>fabric-firewall</b> — clears fabric firewall statistics collected for all egress traffic from the fabric</p> <p><b>all</b> — clears all the collected fabric statistics across all adapter cards or modules. This command is equivalent to clearing the specified adapter card using all keywords above (<b>source-mds</b>, <b>destination-mds</b>, <b>fabric-port</b>, and <b>fabric-global</b>).</p> <p><b>security</b> — clears only security statistics for the specified adapter card</p> <p><b>encryption</b> — specifies that encryption statistics will be cleared for the specified adapter card</p> <p><b>firewall</b> — specifies that firewall statistics will be cleared for the specified adapter card</p> <p><b>ip-transport</b> — specifies that IP transport statistics will be cleared for the specified adapter card</p> <p><b>mirror</b> — specifies that mirror statistics will be cleared for the specified adapter card</p> <p><i>mda-id all</i> — clears all the collected fabric statistics related to the specified adapter card. This command is equivalent to clearing the specified adapter card using all keywords above (<b>source-mds</b>, <b>destination-mds</b>, <b>fabric-port</b>, <b>fabric-global</b>).</p> <p><b>ring all</b> — clears the entire dynamic FDB</p> <p><i>ieee-address</i> — clears the dynamic FDB entry for the specified MAC address</p> <p><i>port-id</i> — clears the dynamic FDB entries for the specified port</p> |

## mw

|                    |                                                                      |
|--------------------|----------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mw</b>                                                            |
| <b>Context</b>     | clear                                                                |
| <b>Description</b> | This command enables the context to clear microwave link parameters. |

## link

|                    |                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>link <i>mw-link-id</i> statistics</b>                                                     |
| <b>Context</b>     | clear mw                                                                                     |
| <b>Description</b> | This command clears microwave link statistics.                                               |
| <b>Parameters</b>  | <i>mw-link-id</i> — specifies the microwave link ID number, using the form <b>mw-link-id</b> |
| <b>Values</b>      | <i>id</i> = 1 to 24                                                                          |

## radio

|                    |                                                 |
|--------------------|-------------------------------------------------|
| <b>Syntax</b>      | <b>radio <i>port-id</i></b>                     |
| <b>Context</b>     | clear mw                                        |
| <b>Description</b> | This command reboots managed microwave devices. |



**Note:** This command will bring down the microwave link; traffic will not pass over it while the radio is rebooting.

|                   |                                                                                                                                                       |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Parameters</b> | <i>port-id</i> — specifies the physical port ID associated with the MPR-e radio, in the format <i>slot/mda/port</i> (where <i>port</i> = 1 through 4) |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|

## rsl-history

|                    |                                                                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>rsl-history <i>port-id</i></b>                                                                                                                     |
| <b>Context</b>     | clear mw                                                                                                                                              |
| <b>Description</b> | This command clears the RSL history for the specified MPR-e radio.                                                                                    |
| <b>Parameters</b>  | <i>port-id</i> — specifies the physical port ID associated with the MPR-e radio, in the format <i>slot/mda/port</i> (where <i>port</i> = 1 through 4) |

## port

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>port</b> <i>port-id</i> <b>statistics</b><br><b>port</b> <i>port-id</i> <b>atm pvc</b> [ <i>vpi</i> [/ <i>vci</i> ]] <b>statistics</b><br><b>port</b> <i>port-id</i> <b>atm pvp</b> [ <i>vpi</i> ] <b>statistics</b><br><b>port</b> <i>port-id</i> <b>frame-relay dlci</b> <i>dlci</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Context</b>     | clear                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b> | This command clears the statistics for the specified port or channel group.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Parameters</b>  | <i>port-id</i> — specifies the physical port ID<br><div style="margin-left: 40px;"> <b>Syntax</b> <i>port-id</i> <i>slot</i>[/<i>mda</i>[/<i>port</i>]] or <i>slot</i>/<i>mda</i>/<i>port</i>[/<i>channel</i>]<br/> <i>bundle-id</i> <i>bundle-type</i>-<i>slot</i>/<i>mda</i>.<i>bundle-num</i><br/> <b>bundle</b> keyword<br/> <i>bundle-num</i>: 1 to 32<br/> <i>type</i> ima, ppp </div><br><b>statistics</b> — specifies that port statistics will be cleared<br><b>atm</b> — specifies that ATM port statistics will be cleared<br><i>vpi</i> — specifies the ATM network virtual path identifier (VPI) for this PVC<br><i>vci</i> — specifies the ATM network virtual channel identifier (VCI) for this PVC<br><b>pvc</b> — clears PVC statistics<br><b>pvp</b> — clears PVP statistics<br><b>frame-relay dlci</b> — clears circuit-level frame relay statistics<br><i>dlci</i> — specifies the frame relay virtual circuit identifier<br>The <b>clear port</b> <i>port-id</i> <b>statistics frame-relay dlci</b> <i>dlci</i> command differs from the <b>clear port</b> <i>port-id</i> <b>statistics</b> command in the sense that the former clears the circuit-level SAP statistics whereas the latter clears the frame-relay port statistics. |

## scada

|                    |                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>scada</b> <i>bridge-id</i> <b>statistics</b>                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | clear                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | This command clears the statistics for all or specified bridges or branches.                                                                                                                                                                                                                                                                     |
| <b>Parameters</b>  | <i>bridge-id</i> — specifies the bridge ID or branch ID (the bridge ID is in the format <i>slot/mda/bridge-id</i> , where <i>bridge-id</i> is 1 to 16; the branch ID is in the format <i>slot/mda/bridge-id.branch-id</i> , where <i>branch-id</i> is 1 to 32)<br><b>statistics</b> — specifies that bridge or branch statistics will be cleared |

### 3.14.2.4 Debug Commands

#### lag

|                    |                                                                                                                                                                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>lag</b> [ <b>lag-id</b> <i>lag-id</i> [ <b>port</b> <i>port-id</i> ]] [ <b>all</b> ]                                                                                                                                                             |
|                    | <b>lag</b> [ <b>lag-id</b> <i>lag-id</i> [ <b>port</b> <i>port-id</i> ]] [ <b>sm</b> ] [ <b>pkt</b> ] [ <b>cfg</b> ] [ <b>red</b> ] [ <b>iom-upd</b> ] [ <b>port-state</b> ] [ <b>timers</b> ] [ <b>sel-logic</b> ] [ <b>mc</b> ] [ <b>mc-pkt</b> ] |
|                    | <b>no lag</b> [ <b>lag-id</b> <i>lag-id</i> ]                                                                                                                                                                                                       |
| <b>Context</b>     | debug                                                                                                                                                                                                                                               |
| <b>Description</b> | This command enables debugging for a LAG.                                                                                                                                                                                                           |
|                    | The <b>no</b> form of the command disables debugging for a LAG.                                                                                                                                                                                     |
| <b>Parameters</b>  | <i>lag-id</i> — specifies the LAG identifier, expressed as a decimal integer                                                                                                                                                                        |
|                    | <b>Values</b> 1 to 32                                                                                                                                                                                                                               |
|                    | <i>port-id</i> — specifies the physical port ID in the <i>slot/mda/port</i> format                                                                                                                                                                  |
|                    | <b>all</b> — traces all LAG and LACP parameters                                                                                                                                                                                                     |
|                    | <b>sm</b> — traces the LACP state machine                                                                                                                                                                                                           |
|                    | <b>pkt</b> — traces LACP packets                                                                                                                                                                                                                    |
|                    | <b>cfg</b> — traces the LAG configuration                                                                                                                                                                                                           |
|                    | <b>red</b> — traces LAG high availability                                                                                                                                                                                                           |
|                    | <b>iom-upd</b> — traces LAG IOM updates                                                                                                                                                                                                             |
|                    | <b>port-state</b> — traces LAG port state transitions                                                                                                                                                                                               |
|                    | <b>timers</b> — traces LAG timers                                                                                                                                                                                                                   |
|                    | <b>sel-logic</b> — traces LACP selection logic                                                                                                                                                                                                      |
|                    | <b>mc</b> — traces multi-chassis parameters                                                                                                                                                                                                         |
|                    | <b>mc-pkt</b> — traces received MC-LAG control packets with valid authentication                                                                                                                                                                    |



## 4 List of Acronyms

**Table 120**     **Acronyms**

| Acronym  | Expansion                                       |
|----------|-------------------------------------------------|
| 2G       | second generation wireless telephone technology |
| 3DES     | triple DES (data encryption standard)           |
| 3G       | third generation mobile telephone technology    |
| 6VPE     | IPv6 on Virtual Private Edge Router             |
| 7705 SAR | 7705 Service Aggregation Router                 |
| 7750 SR  | 7750 Service Router                             |
| 9500 MPR | 9500 microwave packet radio                     |
| ABR      | area border router<br>available bit rate        |
| AC       | alternating current<br>attachment circuit       |
| ACK      | acknowledge                                     |
| ACL      | access control list                             |
| ACR      | adaptive clock recovery                         |
| AD       | auto-discovery                                  |
| ADM      | add/drop multiplexer                            |
| ADP      | automatic discovery protocol                    |
| AES      | advanced encryption standard                    |
| AFI      | authority and format identifier                 |
| AIS      | alarm indication signal                         |
| ALG      | application level gateway                       |
| ANSI     | American National Standards Institute           |
| Apipe    | ATM VLL                                         |
| APS      | automatic protection switching                  |
| ARP      | address resolution protocol                     |
| A/S      | active/standby                                  |

**Table 120 Acronyms (Continued)**

| Acronym  | Expansion                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AS       | autonomous system                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| ASAP     | any service, any port                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| ASBR     | autonomous system boundary router                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| ASM      | any-source multicast<br>autonomous system message                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| ASN      | autonomous system number                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| ATM      | asynchronous transfer mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| ATM PVC  | ATM permanent virtual circuit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| B3ZS     | bipolar with three-zero substitution                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Batt A   | battery A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| B-bit    | beginning bit (first packet of a fragment)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Bc       | committed burst size                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Be       | excess burst size                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| BECN     | backward explicit congestion notification                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Bellcore | Bell Communications Research                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| BFD      | bidirectional forwarding detection                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| BGP      | border gateway protocol                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| BITS     | building integrated timing supply                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| BMCA     | best master clock algorithm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| BMU      | broadcast, multicast, and unknown traffic<br>Traffic that is not unicast. Any nature of multipoint traffic: <ul style="list-style-type: none"> <li>• broadcast (that is, all 1s as the destination IP to represent all destinations within the subnet)</li> <li>• multicast (that is, traffic typically identified by the destination address, uses special destination address); for IP, the destination must be 224.0.0.0 to 239.255.255.255</li> <li>• unknown (that is, the destination is typically a valid unicast address but the destination port/interface is not yet known; therefore, traffic needs to be forwarded to all destinations; unknown traffic is treated as broadcast)</li> </ul> |
| BNM      | bandwidth notification message                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

**Table 120 Acronyms (Continued)**

| Acronym | Expansion                                               |
|---------|---------------------------------------------------------|
| BOF     | boot options file                                       |
| BoS     | bottom of stack                                         |
| BPDU    | bridge protocol data unit                               |
| BRAS    | Broadband Remote Access Server                          |
| BSC     | Base Station Controller                                 |
| BSM     | bootstrap message                                       |
| BSR     | bootstrap router                                        |
| BSTA    | Broadband Service Termination Architecture              |
| BTS     | base transceiver station                                |
| CA      | certificate authority                                   |
| CAS     | channel associated signaling                            |
| CBN     | common bonding networks                                 |
| CBS     | committed buffer space                                  |
| CC      | continuity check<br>control channel                     |
| CCM     | continuity check message                                |
| CCTV    | closed-circuit television                               |
| CE      | circuit emulation<br>customer edge                      |
| CEM     | circuit emulation                                       |
| CES     | circuit emulation services                              |
| CESoPSN | circuit emulation services over packet switched network |
| CFM     | connectivity fault management                           |
| cHDLC   | Cisco high-level data link control protocol             |
| CIDR    | classless inter-domain routing                          |
| CIR     | committed information rate                              |
| CLI     | command line interface                                  |
| CLP     | cell loss priority                                      |

**Table 120 Acronyms (Continued)**

| Acronym     | Expansion                                                                                                                                                                                                                 |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CMP         | certificate management protocol                                                                                                                                                                                           |
| C-multicast | customer multicast                                                                                                                                                                                                        |
| CoS         | class of service                                                                                                                                                                                                          |
| CPE         | customer premises equipment                                                                                                                                                                                               |
| Cpipe       | circuit emulation (or TDM) VLL                                                                                                                                                                                            |
| CPM         | Control and Processing Module (CPM is used instead of CSM when referring to CSM filtering to align with CLI syntax used with other SR products). CSM management ports are referred to as CPM management ports in the CLI. |
| CPROTO      | C prototype                                                                                                                                                                                                               |
| CPU         | central processing unit                                                                                                                                                                                                   |
| C/R         | command/response                                                                                                                                                                                                          |
| CRC         | cyclic redundancy check                                                                                                                                                                                                   |
| CRC-32      | 32-bit cyclic redundancy check                                                                                                                                                                                            |
| CRL         | certificate revocation list                                                                                                                                                                                               |
| CRON        | a time-based scheduling service (from chronos = time)                                                                                                                                                                     |
| CRP         | candidate RP                                                                                                                                                                                                              |
| CSM         | Control and Switching Module                                                                                                                                                                                              |
| CSNP        | complete sequence number PDU                                                                                                                                                                                              |
| CSPF        | constrained shortest path first                                                                                                                                                                                           |
| C-TAG       | customer VLAN tag                                                                                                                                                                                                         |
| CV          | connection verification<br>customer VLAN (tag)                                                                                                                                                                            |
| CW          | control word                                                                                                                                                                                                              |
| CWDM        | coarse wavelength-division multiplexing                                                                                                                                                                                   |
| DA/FAN      | distribution automation and field area network                                                                                                                                                                            |
| DC          | direct current                                                                                                                                                                                                            |
| DC-C        | DC return - common                                                                                                                                                                                                        |
| DCE         | data communications equipment                                                                                                                                                                                             |

**Table 120 Acronyms (Continued)**

| Acronym | Expansion                                                                                                           |
|---------|---------------------------------------------------------------------------------------------------------------------|
| DC-I    | DC return - isolated                                                                                                |
| DCO     | digitally controlled oscillator                                                                                     |
| DCR     | differential clock recovery                                                                                         |
| DDoS    | distributed DoS                                                                                                     |
| DE      | discard eligibility                                                                                                 |
| DER     | distinguished encoding rules                                                                                        |
| DES     | data encryption standard                                                                                            |
| DF      | do not fragment                                                                                                     |
| DH      | Diffie-Hellman                                                                                                      |
| DHB     | decimal, hexadecimal, or binary                                                                                     |
| DHCP    | dynamic host configuration protocol                                                                                 |
| DHCPv6  | dynamic host configuration protocol for IPv6                                                                        |
| DIS     | designated intermediate system                                                                                      |
| DLCI    | data link connection identifier                                                                                     |
| DLCMI   | data link connection management interface                                                                           |
| DM      | delay measurement                                                                                                   |
| DNS     | domain name server                                                                                                  |
| DNU     | do not use                                                                                                          |
| DoS     | denial of service                                                                                                   |
| dot1p   | IEEE 802.1p bits, in Ethernet or VLAN ingress packet headers, used to map traffic to up to eight forwarding classes |
| dot1q   | IEEE 802.1q encapsulation for Ethernet interfaces                                                                   |
| DPD     | dead peer detection                                                                                                 |
| DPI     | deep packet inspection                                                                                              |
| DPLL    | digital phase locked loop                                                                                           |
| DR      | designated router                                                                                                   |
| DSA     | digital signal algorithm                                                                                            |
| DSCP    | differentiated services code point                                                                                  |

**Table 120 Acronyms (Continued)**

| Acronym     | Expansion                                                                                                                   |
|-------------|-----------------------------------------------------------------------------------------------------------------------------|
| DSL         | digital subscriber line                                                                                                     |
| DSLAM       | digital subscriber line access multiplexer                                                                                  |
| DTE         | data termination equipment                                                                                                  |
| DU          | downstream unsolicited                                                                                                      |
| DUID        | DHCP unique identifier                                                                                                      |
| DUS         | do not use for synchronization                                                                                              |
| DV          | delay variation                                                                                                             |
| DVMRP       | distance vector multicast routing protocol                                                                                  |
| e911        | enhanced 911 service                                                                                                        |
| EAP         | Extensible Authentication Protocol                                                                                          |
| EAPOL       | EAP over LAN                                                                                                                |
| E-bit       | ending bit (last packet of a fragment)                                                                                      |
| E-BSR       | elected BSR                                                                                                                 |
| ECMP        | equal cost multipath                                                                                                        |
| EE          | end entity                                                                                                                  |
| EFM         | Ethernet in the first mile                                                                                                  |
| EGP         | exterior gateway protocol                                                                                                   |
| EIA/TIA-232 | Electronic Industries Alliance/Telecommunications Industry Association Standard 232 (also known as <a href="#">RS-232</a> ) |
| EIR         | excess information rate                                                                                                     |
| EJBCA       | Enterprise Java Bean Certificate Authority                                                                                  |
| EL          | entropy label                                                                                                               |
| eLER        | egress label edge router                                                                                                    |
| ELI         | entropy label indicator                                                                                                     |
| E&M         | ear and mouth<br>earth and magneto<br>exchange and multiplexer                                                              |
| eMBMS       | evolved MBMS                                                                                                                |

**Table 120 Acronyms (Continued)**

| Acronym  | Expansion                                                  |
|----------|------------------------------------------------------------|
| EOP      | end of packet                                              |
| EPC      | evolved packet core                                        |
| EPD      | early packet discard                                       |
| Epipe    | Ethernet VLL                                               |
| EPL      | Ethernet private line                                      |
| EPON     | Ethernet Passive Optical Network                           |
| EPS      | equipment protection switching                             |
| ERO      | explicit route object                                      |
| ESD      | electrostatic discharge                                    |
| ESMC     | Ethernet synchronization message channel                   |
| ESN      | extended sequence number                                   |
| ESP      | encapsulating security payload                             |
| ETE      | end-to-end                                                 |
| ETH-BN   | Ethernet bandwidth notification                            |
| ETH-CFM  | Ethernet connectivity fault management (IEEE 802.1ag)      |
| EVC      | Ethernet virtual connection                                |
| EVDO     | evolution - data optimized                                 |
| EVPL     | Ethernet virtual private link                              |
| EXP bits | experimental bits (currently known as <a href="#">TC</a> ) |
| FC       | forwarding class                                           |
| FCS      | frame check sequence                                       |
| FD       | frequency diversity                                        |
| FDB      | forwarding database                                        |
| FDL      | facilities data link                                       |
| FEAC     | far-end alarm and control                                  |
| FEC      | forwarding equivalence class                               |
| FECN     | forward explicit congestion notification                   |

**Table 120 Acronyms (Continued)**

| Acronym    | Expansion                                                 |
|------------|-----------------------------------------------------------|
| FeGW       | far-end gateway                                           |
| FEP        | front-end processor                                       |
| FF         | fixed filter                                              |
| FFD        | fast fault detection                                      |
| FIB        | forwarding information base                               |
| FIFO       | first in, first out                                       |
| FIPS-140-2 | Federal Information Processing Standard publication 140-2 |
| FNG        | fault notification generator                              |
| FOM        | figure of merit                                           |
| Fpipe      | frame relay VLL                                           |
| FQDN       | fully qualified domain name                               |
| FR         | frame relay                                               |
| FRG bit    | fragmentation bit                                         |
| FRR        | fast reroute                                              |
| FTN        | FEC-to-NHLFE                                              |
| FTP        | file transfer protocol                                    |
| FXO        | foreign exchange office                                   |
| FXS        | foreign exchange subscriber                               |
| GFP        | generic framing procedure                                 |
| GigE       | Gigabit Ethernet                                          |
| GLONASS    | Global Navigation Satellite System (Russia)               |
| GNSS       | global navigation satellite system (generic)              |
| GPON       | Gigabit Passive Optical Network                           |
| GPRS       | general packet radio service                              |
| GPS        | Global Positioning System                                 |
| GRE        | generic routing encapsulation                             |
| GRT        | global routing table                                      |



**Table 120 Acronyms (Continued)**

| Acronym     | Expansion                                                            |
|-------------|----------------------------------------------------------------------|
| GSM         | Global System for Mobile Communications (2G)                         |
| GTP-U       | GPRS tunneling protocol user plane                                   |
| HA          | high availability                                                    |
| HCM         | high capacity multiplexing                                           |
| HDB3        | high density bipolar of order 3                                      |
| HDLC        | high-level data link control protocol                                |
| HEC         | header error control                                                 |
| HMAC        | hash message authentication code                                     |
| Hpipe       | HDLC VLL                                                             |
| H-QoS       | hierarchical quality of service                                      |
| HSB         | hot standby                                                          |
| HSDPA       | high-speed downlink packet access                                    |
| HSPA        | high-speed packet access                                             |
| HVPLS       | hierarchical virtual private line service                            |
| IANA        | internet assigned numbers authority                                  |
| IBN         | isolated bonding networks                                            |
| ICB         | inter-chassis backup                                                 |
| ICMP        | Internet control message protocol                                    |
| ICMPv6      | Internet control message protocol for IPv6                           |
| ICP         | IMA control protocol cells                                           |
| IDS         | intrusion detection system                                           |
| IDU         | indoor unit                                                          |
| IED         | intelligent end device                                               |
| IEEE        | Institute of Electrical and Electronics Engineers                    |
| IEEE 1588v2 | Institute of Electrical and Electronics Engineers standard 1588-2008 |
| IES         | Internet Enhanced Service                                            |
| IETF        | Internet Engineering Task Force                                      |

**Table 120 Acronyms (Continued)**

| Acronym  | Expansion                                                 |
|----------|-----------------------------------------------------------|
| IGMP     | Internet group management protocol                        |
| IGP      | interior gateway protocol                                 |
| IID      | instance ID                                               |
| IKE      | Internet key exchange                                     |
| iLER     | ingress label edge router                                 |
| ILM      | incoming label map                                        |
| IMA      | inverse multiplexing over ATM                             |
| INVARP   | inverse address resolution protocol                       |
| IOM      | input/output module                                       |
| IP       | Internet Protocol                                         |
| IPCP     | Internet Protocol Control Protocol                        |
| IPIP     | IP in IP                                                  |
| Ipipe    | IP interworking VLL                                       |
| I-PMSI   | inclusive PMSI                                            |
| IPoATM   | IP over ATM                                               |
| IPS      | intrusion prevention system                               |
| IPSec    | Internet Protocol security                                |
| ISA      | integrated services adapter                               |
| ISAKMP   | Internet security association and key management protocol |
| IS-IS    | Intermediate System-to-Intermediate System                |
| IS-IS-TE | IS-IS-traffic engineering (extensions)                    |
| ISO      | International Organization for Standardization            |
| IW       | interworking                                              |
| JP       | join prune                                                |
| KG       | key group                                                 |
| LB       | loopback                                                  |
| lbf-in   | pound force inch                                          |

**Table 120 Acronyms (Continued)**

| Acronym | Expansion                                         |
|---------|---------------------------------------------------|
| LBM     | loopback message                                  |
| LBO     | line buildout                                     |
| LBR     | loopback reply                                    |
| LCP     | link control protocol                             |
| LDP     | label distribution protocol                       |
| LER     | label edge router                                 |
| LFA     | loop-free alternate                               |
| LFIB    | label forwarding information base                 |
| LIB     | label information base                            |
| LLDP    | link layer discovery protocol                     |
| LLDPDU  | link layer discovery protocol data unit           |
| LLF     | link loss forwarding                              |
| LLID    | loopback location ID                              |
| LM      | loss measurement                                  |
| LMI     | local management interface                        |
| LOS     | line-of-sight<br>loss of signal                   |
| LSA     | link-state advertisement                          |
| LSDB    | link-state database                               |
| LSP     | label switched path<br>link-state PDU (for IS-IS) |
| LSPA    | LSP attributes                                    |
| LSR     | label switch router<br>link-state request         |
| LSU     | link-state update                                 |
| LT      | linktrace                                         |
| LTE     | long term evolution<br>line termination equipment |
| LTM     | linktrace message                                 |

**Table 120 Acronyms (Continued)**

| Acronym  | Expansion                                                              |
|----------|------------------------------------------------------------------------|
| LTN      | LSP ID to NHLFE                                                        |
| LTR      | link trace reply                                                       |
| MA       | maintenance association                                                |
| MAC      | media access control                                                   |
| MA-ID    | maintenance association identifier                                     |
| MBB      | make-before-break                                                      |
| MBGP     | multicast BGP<br>multiprotocol BGP<br>multiprotocol extensions for BGP |
| MBMS     | multimedia broadcast multicast service                                 |
| MBS      | maximum buffer space<br>maximum burst size<br>media buffer space       |
| MBSP     | mobile backhaul service provider                                       |
| MCAC     | multicast connection admission control                                 |
| MC-APS   | multi-chassis automatic protection switching                           |
| MC-MLPPP | multi-class multilink point-to-point protocol                          |
| MCS      | multicast server<br>multi-chassis synchronization                      |
| MCT      | MPT craft terminal                                                     |
| MD       | maintenance domain                                                     |
| MD5      | message digest version 5 (algorithm)                                   |
| MDA      | media dependent adapter                                                |
| MDDDB    | multidrop data bridge                                                  |
| MDL      | maintenance data link                                                  |
| MDT      | multicast distribution tree                                            |
| ME       | maintenance entity                                                     |
| MED      | multi-exit discriminator                                               |
| MEF      | Metro Ethernet Forum                                                   |

**Table 120 Acronyms (Continued)**

| Acronym          | Expansion                                                                                               |
|------------------|---------------------------------------------------------------------------------------------------------|
| MEG              | maintenance entity group                                                                                |
| MEG-ID           | maintenance entity group identifier                                                                     |
| MEN              | Metro Ethernet network                                                                                  |
| MEP              | maintenance association end point                                                                       |
| MFC              | multi-field classification                                                                              |
| MHF              | MIP half function                                                                                       |
| MIB              | management information base                                                                             |
| MI-IS-IS         | multi-instance IS-IS                                                                                    |
| MIR              | minimum information rate                                                                                |
| MLD              | multicast listener discovery                                                                            |
| mLDP             | multicast LDP                                                                                           |
| MLPPP            | multilink point-to-point protocol                                                                       |
| mLSP             | multicast LSP                                                                                           |
| MoFRR            | multicast-only fast reroute                                                                             |
| MP               | merge point<br>multilink protocol<br>multipoint                                                         |
| MP-BGP           | multiprotocol border gateway protocol                                                                   |
| MPLS             | multiprotocol label switching                                                                           |
| MPLSCP           | multiprotocol label switching control protocol                                                          |
| MPP              | MPT protection protocol                                                                                 |
| MPR              | see <a href="#">9500 MPR</a>                                                                            |
| MPR-e            | microwave packet radio-standalone mode                                                                  |
| MPT              | microwave packet transport                                                                              |
| MPT-HC V2/9558HC | microwave packet transport, high capacity version 2                                                     |
| MPT-HLC          | microwave packet transport, high-capacity long-haul cubic (ANSI)                                        |
| MPT-HQAM         | microwave packet transport, high capacity (MPT-HC-QAM) or extended power (MPT-XP-QAM) with 512/1024 QAM |

**Table 120 Acronyms (Continued)**

| Acronym | Expansion                                                                               |
|---------|-----------------------------------------------------------------------------------------|
| MPT-MC  | microwave packet transport, medium capacity                                             |
| MPT-XP  | microwave packet transport, high capacity (very high power version of MPT-HC V2/9558HC) |
| MRAI    | minimum route advertisement interval                                                    |
| MRRU    | maximum received reconstructed unit                                                     |
| MRU     | maximum receive unit                                                                    |
| MSDP    | Multicast Source Discovery Protocol                                                     |
| MSDU    | MAC Service Data Unit                                                                   |
| MSO     | multi-system operator                                                                   |
| MS-PW   | multi-segment pseudowire                                                                |
| MSS     | maximum segment size                                                                    |
| MTIE    | maximum time interval error                                                             |
| MTSO    | mobile trunk switching office                                                           |
| MTU     | maximum transmission unit<br>multi-tenant unit                                          |
| M-VPLS  | management virtual private line service                                                 |
| MVPN    | multicast VPN                                                                           |
| MVR     | multicast VPLS registration                                                             |
| MW      | microwave                                                                               |
| MWA     | microwave awareness                                                                     |
| N·m     | newton meter                                                                            |
| NAT     | network address translation                                                             |
| NAT-T   | network address translation traversal                                                   |
| NBMA    | non-broadcast multiple access (network)                                                 |
| ND      | neighbor discovery                                                                      |
| NE      | network element                                                                         |
| NET     | network entity title                                                                    |
| NFM-P   | Network Functions Manager - Packet (formerly 5620 SAM)                                  |

**Table 120 Acronyms (Continued)**

| Acronym | Expansion                                                                                                        |
|---------|------------------------------------------------------------------------------------------------------------------|
| NGE     | network group encryption                                                                                         |
| NG-MVPN | next generation MVPN                                                                                             |
| NH      | next hop                                                                                                         |
| NHLFE   | next hop label forwarding entry                                                                                  |
| NHOP    | next-hop                                                                                                         |
| NLOS    | non-line-of-sight                                                                                                |
| NLPID   | network level protocol identifier                                                                                |
| NLRI    | network layer reachability information                                                                           |
| NNHOP   | next next-hop                                                                                                    |
| NNI     | network-to-network interface                                                                                     |
| Node B  | similar to BTS but used in 3G networks — term is used in UMTS (3G systems) while BTS is used in GSM (2G systems) |
| NRC-F   | Network Resource Controller - Flow                                                                               |
| NRC-P   | Network Resource Controller - Packet                                                                             |
| NRC-T   | Network Resource Controller - Transport                                                                          |
| NRC-X   | Network Resource Controller - Cross Domain                                                                       |
| NSAP    | network service access point                                                                                     |
| NSD     | Network Services Director                                                                                        |
| NSP     | native service processing<br>Network Services Platform                                                           |
| NSSA    | not-so-stubby area                                                                                               |
| NTP     | network time protocol                                                                                            |
| NTR     | network timing reference                                                                                         |
| OADM    | optical add/drop multiplexer                                                                                     |
| OAM     | operations, administration, and maintenance                                                                      |
| OAMPDU  | OAM protocol data units                                                                                          |
| OC3     | optical carrier level 3                                                                                          |
| OCSP    | online certificate status protocol                                                                               |

**Table 120 Acronyms (Continued)**

| Acronym | Expansion                                      |
|---------|------------------------------------------------|
| ODU     | outdoor unit                                   |
| OIF     | outgoing interface                             |
| OLT     | optical line termination                       |
| OMC     | optical management console                     |
| ONT     | optical network terminal                       |
| OOB     | out-of-band                                    |
| OPX     | off premises extension                         |
| ORF     | outbound route filtering                       |
| OS      | operating system                               |
| OSI     | Open Systems Interconnection (reference model) |
| OSINLCP | OSI Network Layer Control Protocol             |
| OSPF    | open shortest path first                       |
| OSPF-TE | OSPF-traffic engineering (extensions)          |
| OSS     | operations support system                      |
| OSSP    | organization specific slow protocol            |
| OTP     | one time password                              |
| OWAMP   | one-way active measurement protocol            |
| P2MP    | point to multipoint                            |
| PADI    | PPPoE active discovery initiation              |
| PADR    | PPPoE active discovery request                 |
| PAE     | port authentication entities                   |
| PBO     | packet byte offset                             |
| PBR     | policy-based routing                           |
| PBX     | private branch exchange                        |
| PCC     | Path Computation Element Client                |
| PCE     | Path Computation Element                       |
| PCEP    | Path Computation Element Protocol              |



**Table 120 Acronyms (Continued)**

| Acronym     | Expansion                                                |
|-------------|----------------------------------------------------------|
| PCM         | pulse code modulation                                    |
| PCP         | priority code point                                      |
| PCR         | proprietary clock recovery                               |
| PDU         | power distribution unit<br>protocol data units           |
| PDV         | packet delay variation                                   |
| PDVT        | packet delay variation tolerance                         |
| PE          | provider edge router                                     |
| PEAPv0      | protected extensible authentication protocol version 0   |
| PEM         | privacy enhanced mail                                    |
| PFoE        | power feed over Ethernet                                 |
| PFS         | perfect forward secrecy                                  |
| PHB         | per-hop behavior                                         |
| PHY         | physical layer                                           |
| PIC         | prefix independent convergence                           |
| PID         | protocol ID                                              |
| PIM SSM     | protocol independent multicast—source-specific multicast |
| PIR         | peak information rate                                    |
| PKCS        | public key cryptography standards                        |
| PKI         | public key infrastructure                                |
| PLAR        | private line automatic ringdown                          |
| PLCP        | Physical Layer Convergence Protocol                      |
| PLR         | point of local repair                                    |
| PLSP        | path LSP                                                 |
| PMSI        | P-multicast service interface                            |
| P-multicast | provider multicast                                       |
| PoE         | power over Ethernet                                      |
| PoE+        | power over Ethernet plus                                 |

**Table 120 Acronyms (Continued)**

| Acronym | Expansion                                                                               |
|---------|-----------------------------------------------------------------------------------------|
| PoP     | point of presence                                                                       |
| POS     | packet over SONET                                                                       |
| PPP     | point-to-point protocol                                                                 |
| PPPoE   | point-to-point protocol over Ethernet                                                   |
| PPS     | pulses per second                                                                       |
| PRC     | primary reference clock                                                                 |
| PRS     | primary reference source                                                                |
| PRTC    | primary reference time clock                                                            |
| PSE     | power sourcing equipment                                                                |
| PSK     | pre-shared key                                                                          |
| PSN     | packet switched network                                                                 |
| PSNP    | partial sequence number PDU                                                             |
| PTM     | packet transfer mode                                                                    |
| PTP     | performance transparency protocol<br>precision time protocol                            |
| PuTTY   | an open-source terminal emulator, serial console, and network file transfer application |
| PVC     | permanent virtual circuit                                                               |
| PVCC    | permanent virtual channel connection                                                    |
| PW      | pseudowire                                                                              |
| PWE     | pseudowire emulation                                                                    |
| PWE3    | pseudowire emulation edge-to-edge                                                       |
| Q.922   | ITU-T Q-series Specification 922                                                        |
| QL      | quality level                                                                           |
| QoS     | quality of service                                                                      |
| RADIUS  | Remote Authentication Dial In User Service                                              |
| RAN     | Radio Access Network                                                                    |
| RBS     | robbed bit signaling                                                                    |

**Table 120 Acronyms (Continued)**

| Acronym | Expansion                                                             |
|---------|-----------------------------------------------------------------------|
| RD      | route distinguisher                                                   |
| RDI     | remote defect indication                                              |
| RED     | random early discard                                                  |
| RESV    | reservation                                                           |
| RIB     | routing information base                                              |
| RIP     | routing information protocol                                          |
| RJ-45   | registered jack 45                                                    |
| RMON    | remote network monitoring                                             |
| RNC     | Radio Network Controller                                              |
| RP      | rendezvous point                                                      |
| RPF RTM | reverse path forwarding RTM                                           |
| RPS     | radio protection switching                                            |
| RPT     | rendezvous-point tree                                                 |
| RR      | route reflector                                                       |
| RRO     | record route object                                                   |
| RS-232  | Recommended Standard 232 (also known as <a href="#">EIA/TIA-232</a> ) |
| RSA     | Rivest, Shamir, and Adleman (authors of the RSA encryption algorithm) |
| RSHG    | residential split horizon group                                       |
| RSTP    | rapid spanning tree protocol                                          |
| RSVP-TE | resource reservation protocol - traffic engineering                   |
| RT      | receive/transmit                                                      |
| RTC     | route target constraint                                               |
| RTM     | routing table manager                                                 |
| RTN     | battery return                                                        |
| RTP     | real-time protocol                                                    |
| R&TTE   | Radio and Telecommunications Terminal Equipment                       |
| RTU     | remote terminal unit                                                  |

**Table 120 Acronyms (Continued)**

| Acronym | Expansion                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RU      | rack unit                                                                                                                                                                                                                                                                                                                                                                                                                   |
| r-VPLS  | routed virtual private LAN service                                                                                                                                                                                                                                                                                                                                                                                          |
| SA      | security association<br>source-active                                                                                                                                                                                                                                                                                                                                                                                       |
| SAA     | service assurance agent                                                                                                                                                                                                                                                                                                                                                                                                     |
| SAFI    | subsequent address family identifier                                                                                                                                                                                                                                                                                                                                                                                        |
| SAP     | service access point                                                                                                                                                                                                                                                                                                                                                                                                        |
| SAR-8   | 7705 Service Aggregation Router – 8-slot chassis                                                                                                                                                                                                                                                                                                                                                                            |
| SAR-18  | 7705 Service Aggregation Router – 18-slot chassis                                                                                                                                                                                                                                                                                                                                                                           |
| SAR-A   | 7705 Service Aggregation Router – two variants: <ul style="list-style-type: none"> <li>• passively cooled chassis with 12 Ethernet ports and 8 T1/E1 ports</li> <li>• passively cooled chassis with 12 Ethernet ports and no T1/E1 ports</li> </ul>                                                                                                                                                                         |
| SAR-Ax  | 7705 Service Aggregation Router: <ul style="list-style-type: none"> <li>• passively cooled</li> <li>• DC-powered with a dual-feed DC input that can be connected to a +24/-48/-60 VDC power source</li> <li>• equipped with 12 Ethernet ports (ports 1 to 4 are XOR ports and 5 to 12 are 100/1000 Ethernet SFP ports)</li> <li>• equipped with a factory-installed GPS receiver and GNSS RF faceplate connector</li> </ul> |
| SAR-H   | 7705 Service Aggregation Router – temperature- and EMC-hardened to the following specifications: IEEE 1613 and IEC 61850-3                                                                                                                                                                                                                                                                                                  |
| SAR-Hc  | 7705 Service Aggregation Router – compact version of 7705 SAR-H                                                                                                                                                                                                                                                                                                                                                             |

**Table 120 Acronyms (Continued)**

| Acronym | Expansion                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SAR-M   | <p>7705 Service Aggregation Router – four variants:</p> <ul style="list-style-type: none"> <li>• actively cooled chassis with 16 T1/E1 ports, 7 Ethernet ports, and 1 hot-insertable module slot</li> <li>• actively cooled chassis with 0 T1/E1 ports, 7 Ethernet ports, and 1 hot-insertable module slot</li> <li>• passively cooled chassis with 16 T1/E1 ports, 7 Ethernet ports, and 0 module slots</li> <li>• passively cooled chassis with 0 T1/E1 ports, 7 Ethernet ports, and 0 module slots</li> </ul> |
| SAR-O   | <p>7705 Service Aggregation Router passive CWDM device – three variants:</p> <ul style="list-style-type: none"> <li>• 2-wavelength CWDM dual-fiber</li> <li>• 4-wavelength CWDM dual-fiber</li> <li>• 8-wavelength CWDM single-fiber</li> </ul> <p>Each variant has different models that are used to add and drop different wavelengths</p>                                                                                                                                                                     |
| SAR-W   | <p>7705 Service Aggregation Router – passively cooled, universal AC and DC powered unit, equipped with five Gigabit Ethernet ports (three SFP ports and two RJ-45 Power over Ethernet (PoE) ports)</p>                                                                                                                                                                                                                                                                                                           |

**Table 120 Acronyms (Continued)**

| Acronym | Expansion                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SAR-Wx  | <p>7705 Service Aggregation Router – passively cooled, universal AC powered unit; there are six variants:</p> <ul style="list-style-type: none"> <li>• a unit that is equipped with an AC power input connector, five Gigabit Ethernet data ports (three SFP ports and two RJ-45 Ethernet ports), and an RJ-45 alarm input connector</li> <li>• a unit that is equipped with an AC power input connector, five Gigabit Ethernet data ports (three SFP ports and two RJ-45 Ethernet ports), a GPS receiver, and an RJ-45 alarm input connector</li> <li>• a unit that is equipped with an AC power input connector, five Gigabit Ethernet data ports (three SFP ports, one RJ-45 Ethernet port, and one RJ-45 PoE+ port), and an RJ-45 alarm input connector</li> <li>• a unit that is equipped with an AC power input connector, five Gigabit Ethernet data ports (three SFP ports, one RJ-45 Ethernet port, and one RJ-45 PoE+ port), a GPS receiver, and an RJ-45 alarm input connector</li> <li>• a unit that is equipped with an AC power input connector, four Gigabit Ethernet data ports (three SFP ports and one RJ-45 port), one RJ-45 4-pair xDSL port, and an RJ-45 alarm input connector</li> <li>• a unit that is equipped with an AC power input connector, four Gigabit Ethernet data ports (three SFP ports and one RJ-45 port), one RJ-45 4-pair xDSL port, a GPS receiver, and an RJ-45 alarm input connector</li> </ul> |
| SAR-X   | <p>7705 Service Aggregation Router – fan-cooled, rack-mountable, IP20 design, available in two variants:</p> <ul style="list-style-type: none"> <li>• AC-powered variant with a single-feed AC input that can be connected to a 100 to 240 VAC, 50/60 Hz power source</li> <li>• DC-powered variant with a dual-feed DC input that can be connected to a +24/-48/-60 VDC power source</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| SAToP   | structure-agnostic TDM over packet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| SCADA   | surveillance, control and data acquisition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| SC-APS  | single-chassis automatic protection switching                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| SCP     | secure copy                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| SCTP    | Stream Control Transmission Protocol                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

**Table 120 Acronyms (Continued)**

| Acronym | Expansion                                       |
|---------|-------------------------------------------------|
| SD      | signal degrade<br>space diversity               |
| SDH     | synchronous digital hierarchy                   |
| SDI     | serial data interface                           |
| SDN     | software defined network                        |
| SDP     | service destination point                       |
| SE      | shared explicit                                 |
| SeGW    | secure gateway                                  |
| SETS    | synchronous equipment timing source             |
| SF      | signal fail                                     |
| SFP     | small form-factor pluggable (transceiver)       |
| SFTP    | SSH file transfer protocol                      |
| (S,G)   | (source, group)                                 |
| SGT     | self-generated traffic                          |
| SHA-1   | secure hash algorithm                           |
| SHG     | split horizon group                             |
| SIR     | sustained information rate                      |
| SLA     | Service Level Agreement                         |
| SLARP   | serial line address resolution protocol         |
| SLID    | subscriber location identifier of a GPON module |
| SLM     | synthetic loss measurement                      |
| SNMP    | Simple Network Management Protocol              |
| SNPA    | subnetwork point of attachment                  |
| SNR     | signal to noise ratio                           |
| SNTP    | simple network time protocol                    |
| SONET   | synchronous optical networking                  |
| S-PE    | switching provider edge router                  |
| SPF     | shortest path first                             |

**Table 120 Acronyms (Continued)**

| Acronym | Expansion                                                     |
|---------|---------------------------------------------------------------|
| SPI     | security parameter index                                      |
| S-PMSI  | selective PMSI                                                |
| SPT     | shortest path tree                                            |
| SR      | service router (includes 7710 SR, 7750 SR)                    |
| SRLG    | shared risk link group                                        |
| SRP     | stateful request parameter                                    |
| SRRP    | subscriber routed redundancy protocol                         |
| SSH     | secure shell                                                  |
| SSM     | source-specific multicast<br>synchronization status messaging |
| SSU     | system synchronization unit                                   |
| S-TAG   | service VLAN tag                                              |
| STM1    | synchronous transport module, level 1                         |
| STP     | spanning tree protocol                                        |
| SVC     | switched virtual circuit                                      |
| SVEC    | synchronization vector                                        |
| SYN     | synchronize                                                   |
| TACACS+ | Terminal Access Controller Access-Control System Plus         |
| TC      | traffic class (formerly known as <a href="#">EXP bits</a> )   |
| TCP     | transmission control protocol                                 |
| TDA     | transmit diversity antenna                                    |
| TDEV    | time deviation                                                |
| TDM     | time division multiplexing                                    |
| TE      | traffic engineering                                           |
| TEDB    | traffic engineering database                                  |
| TEID    | tunnel endpoint identifier                                    |
| TFTP    | trivial file transfer protocol                                |
| T-LDP   | targeted LDP                                                  |



**Table 120 Acronyms (Continued)**

| Acronym | Expansion                                       |
|---------|-------------------------------------------------|
| TLS     | transport layer security                        |
| TLV     | type length value                               |
| TM      | traffic management                              |
| ToD     | time of day                                     |
| ToS     | type of service                                 |
| T-PE    | terminating provider edge router                |
| TPID    | tag protocol identifier                         |
| TPIF    | IEEE C37.94 teleprotection interface            |
| TPMR    | two-port MAC relay                              |
| TPS     | transmission protection switching               |
| TRAIM   | time-receiver autonomous integrity monitoring   |
| TSoP    | Transparent SDH/SONET over Packet               |
| TTL     | time to live                                    |
| TTLS    | tunneled transport layer security               |
| TTM     | tunnel table manager                            |
| TWAMP   | two-way active measurement protocol             |
| U-APS   | unidirectional automatic protection switching   |
| UBR     | unspecified bit rate                            |
| UDP     | user datagram protocol                          |
| UFD     | unidirectional forwarding detection             |
| UMH     | upstream multicast hop                          |
| UMTS    | Universal Mobile Telecommunications System (3G) |
| UNI     | user-to-network interface                       |
| uRPF    | unicast reverse path forwarding                 |
| V.11    | ITU-T V-series Recommendation 11                |
| V.24    | ITU-T V-series Recommendation 24                |
| V.35    | ITU-T V-series Recommendation 35                |

**Table 120 Acronyms (Continued)**

| Acronym | Expansion                                                                            |
|---------|--------------------------------------------------------------------------------------|
| VC      | virtual circuit                                                                      |
| VCB     | voice conference bridge                                                              |
| VCC     | virtual channel connection                                                           |
| VCCV    | virtual circuit connectivity verification                                            |
| VCI     | virtual circuit identifier                                                           |
| VID     | VLAN ID                                                                              |
| VLAN    | virtual LAN                                                                          |
| VLL     | virtual leased line                                                                  |
| VM      | virtual machine                                                                      |
| VoIP    | voice over IP                                                                        |
| Vp      | peak voltage                                                                         |
| VP      | virtual path                                                                         |
| VPC     | virtual path connection                                                              |
| VPI     | virtual path identifier                                                              |
| VPLS    | virtual private LAN service                                                          |
| VPN     | virtual private network                                                              |
| VPRN    | virtual private routed network                                                       |
| VRF     | virtual routing and forwarding table                                                 |
| VRRP    | virtual router redundancy protocol                                                   |
| VSE     | vendor-specific extension                                                            |
| VSO     | vendor-specific option                                                               |
| VT      | virtual trunk                                                                        |
| WCDMA   | wideband code division multiple access (transmission protocol used in UMTS networks) |
| WRED    | weighted random early discard                                                        |
| WTR     | wait to restore                                                                      |
| X.21    | ITU-T X-series Recommendation 21                                                     |
| XOR     | exclusive-OR                                                                         |

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**Table 120**    **Acronyms (Continued)**

| Acronym | Expansion            |
|---------|----------------------|
| XRO     | exclude route object |



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## 5 Standards and Protocol Support

This chapter lists the 7705 SAR compliance with EMC, environmental, and safety standards, telecom standards, and supported protocols:

- [EMC Industrial Standards Compliance](#)
- [EMC Regulatory and Customer Standards Compliance](#)
- [Environmental Standards Compliance](#)
- [Safety Standards Compliance](#)
- [Telecom Interface Compliance](#)
- [Directives, Regional Approvals and Certifications Compliance](#)
- [Security Standards](#)
- [Telecom Standards](#)
- [Protocol Support](#)
- [Proprietary MIBs](#)

**Table 121 EMC Industrial Standards Compliance**

| Standard                 | Title                                                                                                                                            | Platform       |       |                |       |                |                |                |                |       |        |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------|----------------|-------|----------------|----------------|----------------|----------------|-------|--------|
|                          |                                                                                                                                                  | SAR-X          | SAR-A | SAR-Ax         | SAR-M | SAR-8          | SAR-18         | SAR-H          | SAR-Hc         | SAR-W | SAR-Wx |
| IEEE 1613:2009 + A1:2011 | IEEE Standard Environmental and Testing Requirements for Communications Networking Devices Installed in Electric Power Substations               | ✓ <sup>1</sup> |       | ✓ <sup>1</sup> |       | ✓ <sup>2</sup> | ✓ <sup>1</sup> | ✓ <sup>3</sup> | ✓ <sup>3</sup> |       |        |
| IEEE 1613.1-2013         | IEEE Standard Environmental and Testing Requirements for Communications Networking Devices Installed in Transmission and Distribution Facilities | ✓ <sup>4</sup> |       | ✓ <sup>4</sup> |       | ✓ <sup>5</sup> | ✓ <sup>6</sup> | ✓ <sup>7</sup> | ✓ <sup>7</sup> |       |        |
| IEEE Std C37.90          | IEEE Standard for relays and relay systems associated with Electric Power Apparatus                                                              | ✓              |       | ✓              |       | ✓              | ✓              | ✓              | ✓              |       |        |
| IEEE Std C37.90.1        | Surge Withstand Capability (SWC) Tests                                                                                                           | ✓              |       | ✓              |       | ✓              | ✓              | ✓              | ✓              |       |        |
| IEEE Std C37.90.2        | Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers                                                 | ✓              |       | ✓              |       | ✓              | ✓              | ✓              | ✓              |       |        |
| IEEE Std C37.90.3        | IEEE Standard Electrostatic Discharge Tests for Protective Relays                                                                                | ✓              |       | ✓              |       | ✓              | ✓              | ✓              | ✓              |       |        |
| EN 50121-4               | Electromagnetic Compatibility – Part 4: Emission and Immunity of the Signalling and Telecommunications Apparatus                                 | ✓              | ✓     | ✓              | ✓     | ✓              | ✓              | ✓              | ✓              | ✓     | ✓      |
| IEC 62236-4              | Electromagnetic Compatibility – Part 4: Emission and Immunity of the Signalling and Telecommunications Apparatus                                 | ✓              | ✓     | ✓              | ✓     | ✓              | ✓              | ✓              | ✓              | ✓     | ✓      |
| IEC 61000-6-2            | Generic standards – Immunity for industrial environments                                                                                         | ✓              | ✓     | ✓              | ✓     | ✓              | ✓              | ✓              | ✓              | ✓     | ✓      |
| IEC 61000-6-4            | Generic standards – Emissions standard for industrial environments                                                                               | ✓              | ✓     | ✓              | ✓     | ✓              | ✓              | ✓              | ✓              | ✓     | ✓      |
| IEC 61000-6-5            | Generic standards – immunity for equipment used in power station and substation environment                                                      | ✓              |       | ✓              |       | ✓              | ✓              | ✓              | ✓              |       |        |
| IEC 61850-3              | Communication networks and systems for power utility automation - Part 3: General requirements                                                   | ✓              |       | ✓              |       | ✓              | ✓ <sup>8</sup> | ✓              | ✓              |       |        |
| IEC/AS 60870.2.1         | Telecontrol equipment and systems. Operating conditions. Power supply and electromagnetic compatibility                                          | ✓              |       | ✓              |       | ✓              | ✓              | ✓              | ✓              |       |        |

**Notes:**

1. Performance Class 1
2. Performance Class 1 (Class 2 with Optics interfaces only)
3. Performance Class 2
4. Zone A; Performance Class 1
5. Zone A; Performance Class 1 (Class 2 with Optics interfaces only)
6. Zone B; Performance Class 1
7. Zone A; Performance Class 2
8. With the exception of DC surges

**Table 122 EMC Regulatory and Customer Standards Compliance**

| Standard       | Title                                                                                            | Platform |                |                |                |                |                |       |                |       |        |
|----------------|--------------------------------------------------------------------------------------------------|----------|----------------|----------------|----------------|----------------|----------------|-------|----------------|-------|--------|
|                |                                                                                                  | SAR-X    | SAR-A          | SAR-Ax         | SAR-M          | SAR-8          | SAR-18         | SAR-H | SAR-Hc         | SAR-W | SAR-Wx |
| IEC 61000-4-2  | Electrostatic discharge immunity test                                                            | ✓        | ✓              | ✓              | ✓              | ✓              | ✓              | ✓     | ✓              | ✓     | ✓      |
| IEC 61000-4-3  | Radiated electromagnetic field immunity test                                                     | ✓        | ✓              | ✓              | ✓              | ✓              | ✓              | ✓     | ✓              | ✓     | ✓      |
| IEC 61000-4-4  | Electrical fast transient/burst immunity test                                                    | ✓        | ✓              | ✓              | ✓              | ✓              | ✓              | ✓     | ✓              | ✓     | ✓      |
| IEC 61000-4-5  | Surge immunity test                                                                              | ✓        | ✓              | ✓              | ✓              | ✓              | ✓              | ✓     | ✓              | ✓     | ✓      |
| IEC 61000-4-6  | Immunity to conducted disturbances                                                               | ✓        | ✓              | ✓              | ✓              | ✓              | ✓              | ✓     | ✓              | ✓     | ✓      |
| IEC 61000-4-8  | Power frequency magnetic field immunity test                                                     | ✓        |                | ✓              |                | ✓              | ✓              | ✓     | ✓              |       |        |
| IEC 61000-4-9  | Pulse Magnetic field immunity test                                                               | ✓        |                | ✓              |                | ✓              | ✓              | ✓     | ✓              |       |        |
| IEC 61000-4-10 | Damped Oscillatory Magnetic Field                                                                | ✓        |                | ✓              |                | ✓              | ✓              | ✓     | ✓              |       |        |
| IEC 61000-4-11 | Voltage dips, short interruptions and voltage variations immunity tests                          | ✓        | ✓ <sup>1</sup> | ✓ <sup>1</sup> | ✓ <sup>1</sup> | ✓ <sup>1</sup> | ✓ <sup>1</sup> | ✓     | ✓ <sup>1</sup> | ✓     | ✓      |
| IEC 61000-4-12 | Oscillatory wave immunity test                                                                   | ✓        |                | ✓              |                | ✓              | ✓              | ✓     | ✓              |       |        |
| IEC 61000-4-16 | Conducted immunity 0 Hz - 150 kHz                                                                | ✓        |                | ✓              |                | ✓              | ✓              | ✓     | ✓              |       |        |
| IEC 61000-4-17 | Ripple on d.c. input power port immunity test                                                    | ✓        |                | ✓              |                | ✓              | ✓              | ✓     | ✓              |       |        |
| IEC 61000-4-18 | Damped oscillatory wave immunity test                                                            | ✓        |                | ✓              |                | ✓              | ✓              | ✓     | ✓              |       |        |
| IEC 61000-4-29 | Voltage dips, short interruptions and voltage variations on d.c. input power port immunity tests | ✓        |                | ✓              |                | ✓              | ✓              | ✓     | ✓              |       |        |
| IEC 61000-3-2  | Limits for harmonic current emissions (equipment input current <16A per phase)                   | ✓        | ✓ <sup>1</sup> | ✓ <sup>1</sup> | ✓ <sup>1</sup> | ✓ <sup>1</sup> | ✓ <sup>1</sup> | ✓     | ✓ <sup>1</sup> | ✓     | ✓      |

**Table 122 EMC Regulatory and Customer Standards Compliance (Continued)**

| Standard               | Title                                                                                                                                                                                                                                                     | Platform       |                |                |                |                |                |                |                |                |                |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
|                        |                                                                                                                                                                                                                                                           | SAR-X          | SAR-A          | SAR-Ax         | SAR-M          | SAR-8          | SAR-18         | SAR-H          | SAR-Hc         | SAR-W          | SAR-Wx         |
| IEC 61000-3-3          | Limits for voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current <16A                                                                                                                                           | ✓              | ✓ <sup>1</sup> | ✓ <sup>1</sup> | ✓ <sup>1</sup> | ✓ <sup>1</sup> | ✓ <sup>1</sup> | ✓              | ✓ <sup>1</sup> | ✓              | ✓              |
| ITU-T K.20 (DC Ports)  | Resistibility of telecommunication equipment installed in a telecommunications centre to overvoltages and overcurrents                                                                                                                                    | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |                |                |
| ETSI 300 132-2         | Power supply interface at the input to telecommunications and datacom (ICT) equipment; Part 2: Operated by -48 V direct current (dc)                                                                                                                      | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |                |
| ETSI 300 132-3         | Power supply interface at the input to telecommunications equipment; Part 3: Operated by rectified current source, alternating current source or direct current source up to 400V                                                                         | ✓              | ✓ <sup>1</sup> | ✓ <sup>1</sup> | ✓ <sup>1</sup> |                |                | ✓              | ✓ <sup>1</sup> | ✓              | ✓              |
| EN 300 386             | Telecommunication network equipment; ElectroMagnetic Compatibility (EMC)                                                                                                                                                                                  | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |
| ES 201 468             | Electromagnetic compatibility and Radio spectrum Matters (ERM); Additional ElectroMagnetic Compatibility (EMC) requirements and resistibility requirements for telecommunications equipment for enhanced availability of service in specific applications | ✓              |                | ✓              | ✓              | ✓              | ✓              |                |                |                | ✓              |
| EN 55024               | Information technology equipment - Immunity characteristics - Limits and methods of measurements                                                                                                                                                          | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |
| Telcordia GR-1089-CORE | EMC and Electrical Safety - Generic Criteria for Network Telecommunications Equipment                                                                                                                                                                     | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |
| AS/NZS CISPR 22        | Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement                                                                                                                                                  | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>3</sup> | ✓ <sup>3</sup> |
| FCC Part 15, Subpart B | Radio Frequency devices- Unintentional Radiators (Radiated & Conducted Emissions)                                                                                                                                                                         | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>3</sup> | ✓ <sup>3</sup> |
| ICES-003               | Information Technology Equipment (ITE) — Limits and methods of measurement                                                                                                                                                                                | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>3</sup> | ✓ <sup>3</sup> |



**Table 122 EMC Regulatory and Customer Standards Compliance (Continued)**

| Standard                                                    | Title                                                                                                  | Platform       |                |                |                |                |                |                |                |                |                |
|-------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
|                                                             |                                                                                                        | SAR-X          | SAR-A          | SAR-Ax         | SAR-M          | SAR-8          | SAR-18         | SAR-H          | SAR-Hc         | SAR-W          | SAR-Wx         |
| EN 55022                                                    | Information technology equipment. Radio disturbance characteristics. Limits and methods of measurement | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>3</sup> | ✓ <sup>3</sup> |
| EN 55032                                                    | Electromagnetic compatibility of multimedia equipment – Emission requirements                          | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> |
| CISPR 22                                                    | Information technology equipment. Radio disturbance characteristics. Limits and methods of measurement | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>3</sup> | ✓ <sup>3</sup> |
| CISPR 32                                                    | Electromagnetic compatibility of multimedia equipment – Emission requirements                          | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> |
| GS7 EMC                                                     | Electromagnetic Standard Compatibility (BT standard)                                                   | ✓              |                | ✓              | ✓              | ✓              | ✓              | ✓              |                |                | ✓              |
| KC Notice Emission (KN22) and Immunity (KN24) (South Korea) | EMS standard: NRRA notice                                                                              | ✓              | ✓              |                | ✓              | ✓              | ✓              | ✓              | ✓              |                |                |
| KC Notice Emission (KN32) and Immunity (KN35) (South Korea) | EMS standard: NRRA notice                                                                              |                |                | ✓              |                |                |                |                |                |                |                |

**Notes:**

1. With external AC/DC power supply
2. Class A
3. Class B

**Table 123 Environmental Standards Compliance**

| Standard                              | Title                                                                                                                                                  | Platform       |                |                |                |                |                |                |                |                |                |
|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
|                                       |                                                                                                                                                        | SAR-X          | SAR-A          | SAR-Ax         | SAR-M          | SAR-8          | SAR-18         | SAR-H          | SAR-Hc         | SAR-W          | SAR-Wx         |
| IEEE 1613:2009 + A1:2011              | Environmental and Testing Requirements for Communications Networking Devices                                                                           | ✓ <sup>1</sup> |                | ✓ <sup>1</sup> |                | ✓ <sup>1</sup> | ✓ <sup>1</sup> | ✓              | ✓              |                |                |
| IEC 61850-3                           | Communication networks and systems for power utility automation - Part 3: General requirements                                                         | ✓ <sup>2</sup> |                | ✓ <sup>2</sup> |                | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> |                |                |
| IEC 60068-2-1                         | Environmental testing – Part 2-1: Tests – Test A: Cold                                                                                                 | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |
| IEC 60068-2-2                         | Environmental testing - Part 2-2: Tests - Test B: Dry heat                                                                                             | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |
| IEC 60068-2-30                        | Environmental testing - Part 2: Tests. Test Db and guidance: Damp heat, cyclic (12 + 12-hour cycle)                                                    | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |
| IEC 60255-21-2                        | Electrical relays - Part 21: Vibration, shock, bump and seismic tests on measuring relays and protection equipment - Section Two: Shock and bump tests | ✓              |                | ✓              |                | ✓              | ✓              | ✓              | ✓              |                |                |
| ETSI 300 753 Class 3.2                | Acoustic noise emitted by telecommunications equipment                                                                                                 | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |
| Telcordia GR-63-CORE                  | NEBS Requirements: Physical Protection                                                                                                                 | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |
| ETSI EN 300 019-2-1 v2.1.2, Class 1.2 | Specification of environmental tests; Storage                                                                                                          | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |
| ETSI EN 300 019-2-2 V2.1.2, class 2.3 | Specification of environmental tests; Transportation                                                                                                   | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |
| ETSI EN 300 019-2-3 V2.2.2, class 3.2 | Specification of environmental tests; Stationary use at weatherprotected locations                                                                     | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |                |                |
| ETSI EN 300 019-2-4 v2.2.2 class T4.1 | Specification of environmental tests; Stationary use at non-weatherprotected locations                                                                 |                |                |                |                |                |                |                |                | ✓              | ✓              |
| Telcordia GR-3108-CORE                | Generic Requirements for Network Equipment in the Outside Plant (OSP)                                                                                  | ✓ <sup>3</sup> | ✓ <sup>3</sup> | ✓ <sup>3</sup> | ✓ <sup>3</sup> | ✓ <sup>3</sup> |                | ✓ <sup>3</sup> | ✓ <sup>3</sup> | ✓ <sup>4</sup> | ✓ <sup>4</sup> |
| Telcordia GR-950-CORE                 | Generic Requirements for ONU Closures and ONU Systems                                                                                                  |                |                |                |                |                |                |                |                | ✓              | ✓              |

**Table 123 Environmental Standards Compliance (Continued)**

| Standard                                                                                                                                                                             | Title                          | Platform |       |        |       |       |        |       |        |       |        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|----------|-------|--------|-------|-------|--------|-------|--------|-------|--------|
|                                                                                                                                                                                      |                                | SAR-X    | SAR-A | SAR-Ax | SAR-M | SAR-8 | SAR-18 | SAR-H | SAR-Hc | SAR-W | SAR-Wx |
| "GR-3108 Class 3<br>Section 6.2<br>IEC 60068-2-52 -<br>Severity 3<br>MIL-STD-810G<br>Method 509.5<br>EN 60721-3-3 Class<br>3C4<br>EN 60068-2-11: Salt<br>Mist<br>EN 50155 Class ST4" | Conformal Coating <sup>5</sup> | ✓        |       |        | ✓     | ✓     |        | ✓     | ✓      |       |        |

**Notes:**

1. Forced air system; uses fans
2. Normal environmental conditions as per IEC 61850-3 ed.2
3. Class 2
4. Class 4
5. Conformal coating is available as an orderable option

**Table 124 Safety Standards Compliance**

| Standard       | Title                                                                                               | Platform |       |        |       |       |        |       |        |       |        |
|----------------|-----------------------------------------------------------------------------------------------------|----------|-------|--------|-------|-------|--------|-------|--------|-------|--------|
|                |                                                                                                     | SAR-X    | SAR-A | SAR-Ax | SAR-M | SAR-8 | SAR-18 | SAR-H | SAR-Hc | SAR-W | SAR-Wx |
| UL/CSA 60950-1 | Information technology equipment -<br>Safety - Part 1: General requirements                         | ✓        | ✓     | ✓      | ✓     | ✓     | ✓      | ✓     | ✓      | ✓     | ✓      |
| IEC/EN 60950-1 | Information technology equipment -<br>Safety - Part 1: General requirements                         | ✓        | ✓     | ✓      | ✓     | ✓     | ✓      | ✓     | ✓      | ✓     | ✓      |
| UL/CSA 62368-1 | Audio/video, information and<br>communication technology equipment -<br>Part 1: Safety requirements |          |       | ✓      |       |       |        |       |        |       |        |
| IEC/EN 62368-1 | Audio/video, information and<br>communication technology equipment -<br>Part 1: Safety requirements |          |       | ✓      |       |       |        |       |        |       |        |
| AS/NZS 60950-1 | Information technology equipment -<br>Safety - Part 1: General requirements                         | ✓        | ✓     | ✓      | ✓     | ✓     | ✓      | ✓     | ✓      | ✓     | ✓      |

**Table 124 Safety Standards Compliance (Continued)**

| Standard             | Title                                                                                                                                        | Platform       |                |                |                |                |                |                |                |                |                |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
|                      |                                                                                                                                              | SAR-X          | SAR-A          | SAR-Ax         | SAR-M          | SAR-8          | SAR-18         | SAR-H          | SAR-Hc         | SAR-W          | SAR-Wx         |
| IEC/EN 60825-1 and 2 | Safety of laser products - Part 1: Equipment classification and requirements<br>Part 2: Safety of optical fibre communication systems (OFCS) | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |
| UL/CSA 60950-22      | Information Technology Equipment - Safety - Part 22: Equipment to be Installed Outdoors                                                      |                |                |                |                |                |                |                |                | ✓              | ✓              |
| CSA—C22.2 No.94      | Special Purpose Enclosures                                                                                                                   |                |                |                |                |                |                |                |                | ✓              | ✓              |
| UL50                 | Enclosures for Electrical Equipment, Non-Environmental Consideration                                                                         |                |                |                |                |                |                |                |                | ✓              | ✓              |
| IEC/EN 60950-22      | Information technology equipment. Equipment to be installed Outdoors.                                                                        |                |                |                |                |                |                |                |                | ✓              | ✓              |
| IEC 60529            | Degrees of Protection Provided by Enclosures (IP Code)                                                                                       | ✓ <sup>1</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>1</sup> | ✓ <sup>1</sup> | ✓ <sup>1</sup> | ✓ <sup>2</sup> | ✓ <sup>2</sup> | ✓ <sup>3</sup> | ✓ <sup>3</sup> |

**Notes:**

1. IP20
2. IP40
3. IP65

**Table 125 Telecom Interface Compliance**

| Standard                   | Title                                                                                                                                                 | Platform |       |        |       |       |        |       |        |       |        |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------|--------|-------|-------|--------|-------|--------|-------|--------|
|                            |                                                                                                                                                       | SAR-X    | SAR-A | SAR-AX | SAR-M | SAR-8 | SAR-18 | SAR-H | SAR-Hc | SAR-W | SAR-Wx |
| IC CS-03 Issue 9           | Compliance Specification for Terminal Equipment, Terminal Systems, Network Protection Devices, Connection Arrangements and Hearing Aids Compatibility | ✓        | ✓     |        | ✓     | ✓     | ✓      | ✓     |        |       |        |
| ACTA TIA-968-B             | Telecommunications - Telephone Terminal Equipment - Technical Requirements for Connection of Terminal Equipment to the Telephone Network              | ✓        | ✓     |        | ✓     | ✓     | ✓      | ✓     |        |       |        |
| AS/ACIF S016 (Australia)   | Requirements for Customer Equipment for connection to hierarchical digital interfaces                                                                 | ✓        | ✓     |        | ✓     | ✓     | ✓      | ✓     |        |       |        |
| ATIS-06000403              | Network and Customer Installation Interfaces- DS1 Electrical Interfaces                                                                               | ✓        | ✓     |        | ✓     | ✓     | ✓      | ✓     |        |       |        |
| ANSI/TIA/EIA-422-B (RS422) | Electrical Characteristics for balanced voltage digital interfaces circuits                                                                           |          |       |        |       | ✓     | ✓      |       |        |       |        |
| ITU-T G.825                | The control of jitter and wander within digital networks which are based on the synchronous digital hierarchy (SDH)                                   |          |       |        |       | ✓     | ✓      |       |        |       |        |
| ITU-T G.703                | Physical/electrical characteristics of hierarchical digital interfaces                                                                                | ✓        | ✓     |        | ✓     | ✓     | ✓      | ✓     |        |       |        |
| ITU-T G.712 (E&M)          | Transmission performance characteristics of pulse code modulation channels                                                                            |          |       |        |       | ✓     | ✓      |       |        |       |        |
| ITU-T G.957                | Optical interfaces for equipments and systems relating to the synchronous digital hierarchy                                                           |          |       |        |       | ✓     | ✓      |       |        |       |        |
| ITU-T V.24 (RS232)         | List of definitions for interchange circuits between data terminal equipment (DTE) and data circuit-terminating equipment (DCE)                       |          |       |        |       | ✓     | ✓      | ✓     | ✓      |       |        |
| ITU-T V.28 (V35)           | Electrical characteristics for unbalanced double-current interchange circuits                                                                         |          |       |        |       | ✓     | ✓      |       |        |       |        |
| ITU-T V.36 (V35)           | Modems for synchronous data transmission using 60-108 kHz group band circuits                                                                         |          |       |        |       | ✓     | ✓      |       |        |       |        |

**Table 125 Telecom Interface Compliance (Continued)**

| Standard                   | Title                                                                                                                              | Platform |       |        |       |       |        |       |        |       |        |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------|----------|-------|--------|-------|-------|--------|-------|--------|-------|--------|
|                            |                                                                                                                                    | SAR-X    | SAR-A | SAR-Ax | SAR-M | SAR-8 | SAR-18 | SAR-H | SAR-Hc | SAR-W | SAR-Wx |
| ITU-T V.11 / X.27 (RS-422) | Electrical characteristics for balanced double current interchange circuits operating at data signalling rates up to 10 Mbit/s     |          |       |        |       | ✓     | ✓      |       |        |       |        |
| ITU-T X.21 (RS-422)        | Interface between Data Terminal Equipment and Data Circuit-terminating Equipment for synchronous operation on public data networks |          |       |        |       | ✓     | ✓      |       |        |       |        |
| IEEE 802.3at (POE)         | Data Terminal Equipment Power via the Media Dependent Interfaces Enhancements                                                      |          |       |        | ✓     |       |        | ✓     | ✓      | ✓     | ✓      |

**Table 126 Directives, Regional Approvals and Certifications Compliance**

| Standard                                                 | Title                                                                                                  | Platform |       |        |       |       |        |       |        |       |        |
|----------------------------------------------------------|--------------------------------------------------------------------------------------------------------|----------|-------|--------|-------|-------|--------|-------|--------|-------|--------|
|                                                          |                                                                                                        | SAR-X    | SAR-A | SAR-Ax | SAR-M | SAR-8 | SAR-18 | SAR-H | SAR-Hc | SAR-W | SAR-Wx |
| EU Directive 2014/30/ EU (EMC) (formerly 2004/108/ EC)   | Electromagnetic Compatibility (EMC)                                                                    | ✓        | ✓     | ✓      | ✓     | ✓     | ✓      | ✓     | ✓      | ✓     | ✓      |
| EU Directive 2014/35/ EU (LVD) (formerly 2006/95/ EC)    | Low Voltage Directive (LVD)                                                                            | ✓        | ✓     | ✓      | ✓     | ✓     | ✓      | ✓     | ✓      | ✓     | ✓      |
| EU Directive 2012/19/ EU (WEEE)                          | Waste Electrical and Electronic Equipment (WEEE)                                                       | ✓        | ✓     | ✓      | ✓     | ✓     | ✓      | ✓     | ✓      | ✓     | ✓      |
| EU Directive 2011/65/ EU (RoHS2)                         | Restriction of the use of certain Hazardous Substances in Electrical and Electronic Equipment (Recast) | ✓        | ✓     | ✓      | ✓     | ✓     | ✓      | ✓     | ✓      | ✓     | ✓      |
| CE Mark                                                  |                                                                                                        | ✓        | ✓     | ✓      | ✓     | ✓     | ✓      | ✓     | ✓      | ✓     | ✓      |
| CRoHS Logo; Ministry of Information Industry order No.39 |                                                                                                        | ✓        | ✓     | ✓      | ✓     | ✓     | ✓      | ✓     | ✓      | ✓     | ✓      |
| China (MII NAL) Network Access License                   |                                                                                                        |          | ✓     |        | ✓     | ✓     | ✓      | ✓     |        | ✓     |        |

**Table 126 Directives, Regional Approvals and Certifications Compliance (Continued)**

| Standard                | Title | Platform |       |        |       |       |        |       |        |       |        |
|-------------------------|-------|----------|-------|--------|-------|-------|--------|-------|--------|-------|--------|
|                         |       | SAR-X    | SAR-A | SAR-Ax | SAR-M | SAR-8 | SAR-18 | SAR-H | SAR-Hc | SAR-W | SAR-Wx |
| South Korea (KC Mark)   |       | ✓        | ✓     | ✓      | ✓     | ✓     | ✓      | ✓     | ✓      |       |        |
| Australia (RCM Mark)    |       | ✓        | ✓     | ✓      | ✓     | ✓     | ✓      | ✓     | ✓      | ✓     | ✓      |
| Japan (VCCI Mark)       |       | ✓        | ✓     | ✓      | ✓     | ✓     | ✓      | ✓     |        |       |        |
| NEBS Level 3            |       | ✓        | ✓     | ✓      | ✓     | ✓     | ✓      | ✓     | ✓      | ✓     | ✓      |
| TL9000 certified        |       | ✓        | ✓     | ✓      | ✓     | ✓     | ✓      | ✓     | ✓      | ✓     | ✓      |
| ISO 14001 certified     |       | ✓        | ✓     | ✓      | ✓     | ✓     | ✓      | ✓     | ✓      | ✓     | ✓      |
| ISO 9001:2008 certified |       | ✓        | ✓     | ✓      | ✓     | ✓     | ✓      | ✓     | ✓      | ✓     | ✓      |

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## Security Standards

FIPS 140-2—Federal Information Processing Standard publication 140-2, Security Requirements for Cryptographic Modules

## Telecom Standards

ANSI/TIA/EIA-232-C—Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange

IEEE 802.1ad—IEEE Standard for Local and Metropolitan Area Networks---Virtual Bridged Local Area Networks

IEEE 802.1ag—Service Layer OAM

IEEE 802.1p/q—VLAN Tagging

IEEE 802.3—10BaseT

IEEE 802.3ab—1000BaseT

IEEE 802.3ah—Ethernet OAM

IEEE 802.3u—100BaseTX

IEEE 802.3x —Flow Control

IEEE 802.3z—1000BaseSX/LX

IEEE 802.3-2008—Revised base standard

IEEE 802.1AX-2008—Link Aggregation Task Force (transferred from IEEE 802.3ad)

IEEE C37.94-2002—N Times 64 Kilobit Per Second Optical Fiber Interfaces Between Teleprotection and Multiplexer Equipment

ITU-T G.704—Synchronous frame structures used at 1544, 6312, 2048, 8448 and 44 736 kbit/s hierarchical levels

ITU-T G.707—Network node interface for the Synchronous Digital Hierarchy (SDH)

ITU-T G.984.1—Gigabit-capable passive optical networks (GPON): general characteristics

ITU-T Y.1564—Ethernet service activation test methodology

ITU-T Y.1731—OAM functions and mechanisms for Ethernet-based networks

## Protocol Support

### ATM

AF-PHY-0086.001—Inverse Multiplexing for ATM (IMA)

af-tm-0121.000—Traffic Management Specification Version 4.1, March 1999

GR-1113-CORE—Bellcore, Asynchronous Transfer Mode (ATM) and ATM Adaptation Layer (AAL) Protocols Generic Requirements, Issue 1, July 1994

GR-1248-CORE—Generic Requirements for Operations of ATM Network Elements (NEs). Issue 3 June 1996



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ITU-T Recommendation I.432.1—B-ISDN user-network interface - Physical layer specification: General characteristics  
ITU-T Recommendation I.610—B-ISDN Operation and Maintenance Principles and Functions version 11/95  
RFC 2514—Definitions of Textual Conventions and OBJECT\_IDENTITIES for ATM Management, February 1999  
RFC 2515—Definition of Managed Objects for ATM Management, February 1999  
RFC 2684—Multiprotocol Encapsulation over ATM Adaptation Layer 5

**BFD**

draft-ietf-bfd-mib-00.txt—Bidirectional Forwarding Detection Management Information Base  
draft-ietf-bfd-base-o5.txt—Bidirectional Forwarding Detection  
draft-ietf-bfd-v4v6-1hop-06.txt—BFD IPv4 and IPv6 (Single Hop)  
draft-ietf-bfd-multihop-06.txt—BFD for Multi-hop Paths

**BGP**

RFC 1397—BGP Default Route Advertisement  
RFC 1997—BGP Communities Attribute  
RFC 2385—Protection of BGP Sessions via the TCP MD5 Signature Option  
RFC 2439—BGP Route Flap Dampening  
RFC 2547bis—BGP/MPLS VPNs  
RFC 2918—Route Refresh Capability for BGP-4  
RFC 3107—Carrying Label Information in BGP-4  
RFC 3392—Capabilities Advertisement with BGP-4  
RFC 4271—BGP-4 (previously RFC 1771)  
RFC 4360—BGP Extended Communities Attribute  
RFC 4364—BGP/MPLS IP Virtual Private Networks (VPNs) (previously RFC 2574bis BGP/MPLS VPNs)  
RFC 4456—BGP Route Reflection: Alternative to Full-mesh IBGP (previously RFC 1966 and RFC 2796)  
RFC 4486—Subcodes for BGP Cease Notification Message  
RFC 4684—Constrained Route Distribution for Border Gateway Protocol/ MultiProtocol Label Switching (BGP/MPLS) Internet Protocol (IP) Virtual Private Networks (VPNs)  
RFC 4724—Graceful Restart Mechanism for BGP - GR Helper  
RFC 4760—Multi-protocol Extensions for BGP (previously RFC 2858)  
RFC 4893—BGP Support for Four-octet AS Number Space  
RFC 6513—Multicast in MPLS/BGP IP VPNs

RFC 6514—BGP Encodings and Procedures for Multicast in MPLS/BGP IP VPNs  
draft-ietf-idr-add-paths-04.txt—Advertisement of Multiple Paths in BGP  
draft-ietf-idr-add-paths-guidelines-00.txt—Best Practices for Advertisement of Multiple Paths in BGP

**DHCP/DHCPv6**

RFC 1534—Interoperation between DHCP and BOOTP  
RFC 2131—Dynamic Host Configuration Protocol (REV)  
RFC 2132—DHCP Options and BOOTP Vendor Extensions  
RFC 3046—DHCP Relay Agent Information Option (Option 82)  
RFC 3315—Dynamic Host Configuration Protocol for IPv6  
RFC 3736—Stateless Dynamic Host Configuration Protocol (DHCP) Service for IPv6

**Differentiated Services**

RFC 2474—Definition of the DS Field in the IPv4 and IPv6 Headers  
RFC 2597—Assured Forwarding PHB Group  
RFC 2598—An Expedited Forwarding PHB  
RFC 3140—Per-Hop Behavior Identification Codes

**Digital Data Network Management**

V.35  
RS-232 (also known as EIA/TIA-232)  
X.21

**DSL Modules**

IEEE 802.2 LLC/SNAP bridged encapsulation while operating in ATM bonded mode  
ITU-T G.991.2 Annex A, B, F and ITU-T G.991.2 Amendment 2 Annex G—SHDSL standards compliance  
ITU-T G.991.2 Appendix F and G—Support for up to 5696 Kb/s per pair  
ITU-T G.992.1 (ADSL)  
ITU-T G.992.3 (G.dmt.bis), Annex A, B, J, M  
ITU-T G.992.3 Annex K.2 (ADSL2)  
ITU-T G.992.5, Annex A, B, J, M  
ITU-T G.992.5 Annex K (ADSL2+)  
ITU-T G.993.2 Amendment 1—Seamless Rate Adaptation  
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ITU-T G.993.2 Annex K.3—Supported Transport Protocol Specific Transmission Convergence functions  
ITU G.994.1 (2/07) Amendment 1 and 2—G.hs Handshake

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ITU-T G.998.2—SHDSL 4-pair EFM bonding  
ITU-T G.998.4 G.inp—Physical layer retransmission  
ITU-T Y.1564 Ethernet service activation test methodology  
TR-060—SHDSL rate and reach  
TR112 (U-R2 Deutsche Telekom AG) Version 7.0 and report of Self-Test-Result  
(ITU-T Register#3)

**ECMP**

RFC 2992—Analysis of an Equal-Cost Multi-Path Algorithm

**Frame Relay**

ANSI T1.617 Annex D—Signalling Specification For Frame Relay Bearer Service  
ITU-T Q.922 Annex A—Digital Subscriber Signalling System No. 1 (DSS1) data link  
layer - ISDN data link layer specification for frame mode bearer services  
FRF.1.2—PVC User-to-Network Interface (UNI) Implementation Agreement  
FRF.12—Frame Relay Fragmentation Implementation Agreement  
RFC 2427—Multiprotocol Interconnect over Frame Relay

**GRE**

RFC 2784—Generic Routing Encapsulation (GRE)

**IPSec**

ITU-T X.690 (2002)—ASN.1 encoding rules: Specification of Basic Encoding Rules  
(BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules  
(DER)  
PKCS #12 Personal Information Exchange Syntax Standard  
RFC 2315—PKCS #7: Cryptographic Message Syntax  
RFC 2401—Security Architecture for the Internet Protocol  
RFC 2409—The Internet Key Exchange (IKE)  
RFC 2986—PKCS #10: Certification Request Syntax Specification  
RFC 3706—A Traffic-Based Method of Detecting Dead Internet Key Exchange (IKE)  
Peers  
RFC 3947—Negotiation of NAT-Traversal in the IKE  
RFC 3948—UDP Encapsulation of IPsec ESP Packets  
RFC 4303—IP Encapsulating Security Payload (ESP)  
RFC 4210—Internet X.509 Public Key Infrastructure Certificate Management  
Protocol (CMP)  
RFC 4211—Internet X.509 Public Key Infrastructure Certificate Request Message  
Format (CRMF)  
RFC 4945—The Internet IP Security PKI Profile of IKEv1/ISAKMP, IKEv2, and PKIX

RFC 5280—Internet X.509 Public Key Infrastructure Certificate and Certificate Revocation List (CRL) Profile

RFC 5996—Internet Key Exchange Protocol Version 2 (IKEv2)

### **IPv6**

RFC 2460—Internet Protocol, Version 6 (IPv6) Specification

RFC 2462—IPv6 Stateless Address Autoconfiguration

RFC 2464—Transmission of IPv6 Packets over Ethernet Networks

RFC 3587—IPv6 Global Unicast Address Format

RFC 3595—Textual Conventions for IPv6 Flow Label

RFC 4007—IPv6 Scoped Address Architecture

RFC 4193—Unique Local IPv6 Unicast Addresses

RFC 4291—IPv6 Addressing Architecture

RFC 4443—Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 Specification

RFC 4649—DHCPv6 Relay Agent Remote-ID Option

RFC 4861—Neighbor Discovery for IP version 6 (IPv6)

RFC 5095—Deprecation of Type 0 Routing Headers in IPv6

RFC 5952—A Recommendation for IPv6 Address Text Representation

### **IS-IS**

RFC 1142—OSI IS-IS Intra-domain Routing Protocol (ISO 10589)

RFC 1195—Use of OSI IS-IS for routing in TCP/IP & dual environments

RFC 2763—Dynamic Hostname Exchange for IS-IS

RFC 2966—Domain-wide Prefix Distribution with Two-Level IS-IS

RFC 2973—IS-IS Mesh Groups

RFC 3373—Three-Way Handshake for Intermediate System to Intermediate System (IS-IS) Point-to-Point Adjacencies

RFC 3567—Intermediate System to Intermediate System (IS-IS) Cryptographic Authentication

RFC 3719—Recommendations for Interoperable Networks using IS-IS

RFC 3784—Intermediate System to Intermediate System (IS-IS) Extensions for Traffic Engineering (TE)

RFC 3787—Recommendations for Interoperable IP Networks

RFC 4205 for Shared Risk Link Group (SRLG) TLV

RFC 5304—IS-IS Cryptographic Authentication

RFC 5308—Routing IPv6 with IS-IS

RFC 5309—Point-to-Point Operation over LAN in Link State Routing Protocols

RFC 5310—IS-IS Generic Cryptographic Authentication

**LDP**

RFC 5036—LDP Specification

RFC 5283—LDP Extension for Inter-Area Label Switched Paths

RFC 5443—LDP IGP Synchronization

RFC 6388—Label Distribution Protocol Extensions for Point-to-Multipoint and Multipoint-to-Multipoint Label Switched Paths

RFC 6512—Using Multipoint LDP When the Backbone Has No Route to the Root  
draft-pdutta-mpls-mldp-up-redundancy-00.txt—Upstream LSR Redundancy for Multi-point LDP Tunnels

**LDP and IP FRR**

RFC 5286—Basic Specification for IP Fast Reroute: Loop-Free Alternates

**MPLS**

RFC 3031—MPLS Architecture

RFC 3032—MPLS Label Stack Encoding

RFC 3815—Definitions of Managed Objects for the Multiprotocol Label Switching (MPLS), Label Distribution Protocol (LDP)

RFC 6790—The Use of Entropy Labels in MPLS Forwarding

**MPLS – OAM**

RFC 4379—Detecting Multi-Protocol Label Switched (MPLS) Data Plane Failures

RFC 6424— Mechanism for Performing Label Switched Path Ping (LSP Ping) over MPLS Tunnels

**Multicast**

RFC 3956—Embedding the Rendezvous Point (RP) Address in an IPv6 Multicast Address

RFC 3973—Protocol Independent Multicast - Dense Mode (PIM-DM): Protocol Specification (Revised)

RFC 4610—Anycast-RP Using Protocol Independent Multicast (PIM), which is similar to RFC 3446—Anycast Rendezvous Point (RP) mechanism using Protocol Independent Multicast (PIM) and Multicast Source Discovery Protocol (MSDP)

RFC 6514—BGP Encodings and Procedures for Multicast in MPLS/IP VPNs

cisco-ipmulticast/pim-autorp-spec—Auto-RP: Automatic discovery of Group-to-RP mappings for IP multicast, which is similar to RFC 5059—Bootstrap Router (BSR) Mechanism for Protocol Independent Multicast (PIM)

draft-ietf-l2vpn-vpls-pim-snooping-07—Protocol Independent Multicast (PIM) over Virtual Private LAN Service (VPLS)

draft-ietf-mboned-msdp-deploy-nn.txt—Multicast Source Discovery Protocol (MSDP) Deployment Scenarios

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IANA-IFType-MIB

ITU-T X.721—Information technology- OSI-Structure of Management Information

ITU-T X.734—Information technology- OSI-Systems Management: Event Report  
Management Function

M.3100/3120—Equipment and Connection Models

RFC 1157—SNMPv1

RFC 1850—OSPF-MIB

RFC 1907—SNMPv2-MIB

RFC 2011—IP-MIB

RFC 2012—TCP-MIB

RFC 2013—UDP-MIB

RFC 2030—Simple Network Time Protocol (SNTP) Version 4 for IPv4, IPv6 and OSI

RFC 2096—IP-FORWARD-MIB

RFC 2138—RADIUS

RFC 2206—RSVP-MIB

RFC 2571—SNMP-FRAMEWORKMIB

RFC 2572—SNMP-MPD-MIB

RFC 2573—SNMP-TARGET-&amp;-NOTIFICATION-MIB

RFC 2574—SNMP-USER-BASED-SMMIB

RFC 2575—SNMP-VIEW-BASED ACM-MIB

RFC 2576—SNMP-COMMUNITY-MIB

RFC 2588—SONET-MIB

RFC 2665—EtherLike-MIB

RFC 2819—RMON-MIB

RFC 2863—IF-MIB

RFC 2864—INVERTED-STACK-MIB

RFC 3014—NOTIFICATION-LOG MIB

RFC 3164—The BSD Syslog Protocol

RFC 3273—HCRMON-MIB

RFC 3411—An Architecture for Describing Simple Network Management Protocol  
(SNMP) Management FrameworksRFC 3412—Message Processing and Dispatching for the Simple Network  
Management Protocol (SNMP)

RFC 3413—Simple Network Management Protocol (SNMP) Applications

RFC 3414—User-based Security Model (USM) for version 3 of the Simple Network  
Management Protocol (SNMPv3)

RFC 3418—SNMP MIB

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TMF 509/613—Network Connectivity Model

### **OSPF**

RFC 1765—OSPF Database Overflow  
RFC 2328—OSPF Version 2  
RFC 2370—Opaque LSA Support  
RFC 2740—OSPF for IPv6  
RFC 3101—OSPF NSSA Option  
RFC 3137—OSPF Stub Router Advertisement  
RFC 3509—Alternative Implementations of OSPF Area Border Routers  
RFC 3623—Graceful OSPF Restart (support for Helper mode)  
RFC 3630—Traffic Engineering (TE) Extensions to OSPF  
RFC 4203 for Shared Risk Link Group (SRLG) sub-TLV  
RFC 4577—OSPF as the Provider/Customer Edge Protocol for BGP/MPLS IP  
Virtual Private Networks (VPNs) (support for basic OSPF at PE-CE links)

### **OSPFv3**

RFC 4552—Authentication/Confidentiality for OSPFv3

### **PPP**

RFC 1332—PPP Internet Protocol Control Protocol (IPCP)  
RFC 1570—PPP LCP Extensions  
RFC 1619—PPP over SONET/SDH  
RFC 1661—The Point-to-Point Protocol (PPP)  
RFC 1662—PPP in HDLC-like Framing  
RFC 1989—PPP Link Quality Monitoring  
RFC 1990—The PPP Multilink Protocol (MP)  
RFC 2686—The Multi-Class Extension to Multi-Link PPP

### **Pseudowires**

Metro Ethernet Forum—Implementation Agreement for the Emulation of PDH  
Circuits over Metro Ethernet Networks  
RFC 3550—RTP: A Transport Protocol for Real-Time Applications  
RFC 3985—Pseudo Wire Emulation Edge-to-Edge (PWE3) Architecture

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RFC 4385—Pseudowire Emulation Edge-to-Edge (PWE3) Control Word for Use over an MPLS PSN

RFC 4446—IANA Allocation for PWE3

RFC 4447—Pseudowire Setup and Maintenance Using the Label Distribution Protocol (LDP)

RFC 4448—Encapsulation Methods for Transport of Ethernet over MPLS Networks

RFC 4553—Structure-Agnostic Time Division Multiplexing (TDM) over Packet (SAToP)

RFC 4717—Encapsulation Methods for Transport of Asynchronous Transfer Mode (ATM) over MPLS Networks

RFC 4618—Encapsulation Methods for Transport of PPP/High-Level Data Link Control (HDLC) over MPLS Networks

RFC 4619—Encapsulation Methods for Transport of Frame Relay over Multiprotocol Label Switching (MPLS) Networks

RFC 4816—Pseudowire Emulation Edge-to-Edge (PWE3) Asynchronous Transfer Mode (ATM) Transparent Cell Transport Service

RFC 5085—Pseudowire Virtual Circuit Connectivity Verification (VCCV): A Control Channel for Pseudowires

RFC 5086—Structure-Aware Time Division Multiplexed (TDM) Circuit Emulation Service over Packet Switched Network (CESoPSN)

draft-ietf-pwe3-redundancy-02.txt—Pseudowire (PW) Redundancy

**RIP**

RFC 1058—Routing Information Protocol

RFC 2453—RIP Version 2

**RADIUS**

RFC 2865—Remote Authentication Dial In User Service

RFC 2866—RADIUS Accounting

**RSVP-TE and FRR**

RFC 2430—A Provider Architecture for DiffServ & TE

RFC 2961—RSVP Refresh Overhead Reduction Extensions

RFC 2702—Requirements for Traffic Engineering over MPLS

RFC 2747—RSVP Cryptographic Authentication

RFC 3097—RSVP Cryptographic Authentication - Updated Message Type Value

RFC 3209—Extensions to RSVP for LSP Tunnels

RFC 3210—Applicability Statement for Extensions to RSVP for LSP Tunnels

RFC 3477—Signalling Unnumbered Links in Resource ReSerVation Protocol - Traffic Engineering (RSVP-TE)



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RFC 4090—Fast Reroute Extensions to RSVP-TE for LSP Tunnels  
RFC 5440—Path Computation Element (PCE) Communication Protocol (PCEP)  
draft-ietf-pce-stateful-pce—PCEP Extensions for Stateful PCE  
draft-ietf-pce-segment-routing—PCEP Extensions for Segment Routing  
draft-alvarez-pce-path-profiles—PCE Path Profiles

**SONET/SDH**

GR-253-CORE—SONET Transport Systems: Common Generic Criteria. Issue 3, September 2000  
ITU-T Recommendation G.841—Telecommunication Standardization Section of ITU, Types and Characteristics of SDH Networks Protection Architecture, issued in October 1998 and as augmented by Corrigendum1 issued in July 2002

**SSH**

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draft-ietf-secsh-transport.txt—SSH Transport Layer Protocol  
draft-ietf-secsh-connection.txt—SSH Connection Protocol  
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**Synchronization**

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G.803—Architecture of transport networks based on the synchronous digital hierarchy (SDH)  
G.813—Timing characteristics of SDH equipment slave clocks (SEC)  
G.823—The control of jitter and wander within digital networks which are based on the 2048 kbit/s hierarchy, 2003/03/16  
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G.8261—Timing and synchronization aspects in packet networks  
G.8262—Timing characteristics of synchronous Ethernet equipment slave clock  
GR 1244 CORE—Clocks for the Synchronized Network: Common Generic Criteria  
IEEE Std 1588-2008—IEEE Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems  
ITU-T G.8264—Telecommunication Standardization Section of ITU, Distribution of timing information through packet networks, issued 10/2008  
ITU-T G.8265.1—Telecommunication Standardization Section of ITU, Precision time protocol telecom profile for frequency synchronization, issued 10/2010

ITU-T G.8275.1—Telecommunication Standardization Section of ITU, Precision time protocol telecom profile for phase/time synchronization with full timing support from the network, issued 07/2014

RFC 5905—Network Time Protocol Version 4: Protocol and Algorithms Specification

### **TACACS+**

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### **TCP/IP**

RFC 768—User Datagram Protocol

RFC 791—Internet Protocol

RFC 792—Internet Control Message Protocol

RFC 793—Transmission Control Protocol

RFC 826—Ethernet Address Resolution Protocol

RFC 854—Telnet Protocol Specification

RFC 1350—The TFTP Protocol (Rev. 2)

RFC 1812—Requirements for IPv4 Routers

### **TWAMP**

RFC 5357—A Two-Way Active Measurement Protocol (TWAMP)

### **VPLS**

RFC 4762—Virtual Private LAN Services Using LDP

### **VRRP**

RFC 2787—Definitions of Managed Objects for the Virtual Router Redundancy Protocol

RFC 3768 Virtual Router Redundancy Protocol

RFC 5798 Virtual Router Redundancy Protocol Version 3 for IPv4 and IPv6

## **Proprietary MIBs**

TIMETRA-ATM-MIB.mib

TIMETRA-CAPABILITY-7705-V1.mib

TIMETRA-CHASSIS-MIB.mib

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TIMETRA-LDP-MIB.mib

TIMETRA-LOG-MIB.mib

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TIMETRA-OAM-TEST-MIB.mib  
TIMETRA-PORT-MIB.mib  
TIMETRA-PPP-MIB.mib  
TIMETRA-QOS-MIB.mib  
TIMETRA-ROUTE-POLICY-MIB.mib  
TIMETRA-RSVP-MIB.mib  
TIMETRA-SAP-MIB.mib  
TIMETRA-SDP-MIB.mib  
TIMETRA-SECURITY-MIB.mib  
TIMETRA-SERV-MIB.mib  
TIMETRA-SYSTEM-MIB.mib  
TIMETRA-TC-MIB.mib  
TIMETRA-VRRP-MIB.mib



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