Technical Guide

Pluggables and Cabling

Feature Overview and Configuration Guide

Introduction

This guide describes the following cable diagnostic tools and how to use them:

- Cable Fault Locator (CFL)

  The Cable Fault Locator is a copper cable diagnostic tool located within the switch. For a selected port, the CFL will display connection status or faults that exist in either the connecting cable itself, or its terminations.

- Optical Digital Diagnostic Monitoring (DDM)

  Digital monitoring allows you to measure operating parameters for pluggables installed in a switch and troubleshoot fiber issues. This helps to have advance warning of failing pluggables or cables, and helps find fiber issues when links go down.

- Active Fiber Monitoring

  Active fiber monitoring allows the switch or firewall to check fiber links for reduced power reception that may indicate mechanical bending of the fiber cable.

Products and software version that apply to this guide

This guide applies to AlliedWare Plus™ products that support Cable Fault Locator and Digital Monitoring, running version **5.4.4** or later, and AlliedWare Plus products that support Active Fiber Monitoring, running version **5.4.5-2** or later.

To see whether your product supports Cable Fault Locator, Digital Monitoring and Cable Fault Locator, see the following documents:

- The product's Datasheet
- The AlliedWare Plus Datasheet
- The product's Command Reference

These documents are available from the above links on our website at alliedtelesis.com.

Feature support may change in later software versions. For the latest information, see the above documents.

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Cable Fault Locator

The Cable Fault Locator (CFL) is a cable diagnostic tool located within the switch. For a selected port, the CFL will display connection status or faults that exist in either the connecting cable itself, or its terminations.

Capabilities

The CFL is designed to operate on cable systems that use the following:

- fixed copper ports, i.e. not using SFP type pluggable transceivers.
- unshielded twisted pair data cables such as CAT 5 or CAT 6 and up to 100 meters long.
- cable terminations that use RJ-45 or RJ-0.5 connections.
- data rates from 10 Mbps to 1 Gbps (10 Gbps over copper cable is not supported).

The CFL operates using a technology known as Time Domain Reflectometry (TDR) to test all four pairs of wires inside the cable.

Note that CFL cannot run on a port that is currently supplying power via PoE.

TDR Operating Principles

When a data cable is correctly terminated, the data energy traveling along it is absorbed by its terminating load resistance. However, if the cable is unplugged, broken or short circuited, this energy is reflected at the cable termination and travels back along the cable towards its source connection.

To test the cable, the CFL generates a pulse at the cable source connection and monitors the cable for the presence of a returning (reflected) pulse. By measuring the timing between the transmitted and reflected pulses, the CFL can calculate the distance between a fault (usually at the distant termination) and cable's source connection. Also, by detecting the polarity of the reflected signal, the CFL can determine whether the fault is due to an open circuit, or a short circuit, condition.

Using the Cable Fault Locator

To run a CFL diagnostics test, use the command, **test cable-diagnostics tdr interface**. This will return a prompt asking you to confirm whether or not you want to continue with the test. This confirmation prompt is generated because the link is unable to carry data during the test, typically taking between 1 and 2 seconds to complete.

Example To run a CFL test on the cable inserted into port 1.0.1, use the following command:

```
awplus# test cable-diagnostics tdr interface port1.0.1
```

This command returns the following message:

```
Link will go down while test is in progress. Continue? (y/n):y
```

Answering ‘y’ returns the following message:

```
Test started. This will take several seconds to complete. Use "show test
cable-diagnostics tdr" to print results.
```

Once the cable test has run you can display its results by running the **show test cable-diagnostics tdr** command.

Output Table 1: Example output from **show test cable-diagnostics tdr**

```
awplus#show test cable-diagnostics tdr

Port     Pair  Length       Status
-------------------------------------------------
1.0.1    A     -            OK
         B     -            OK
         C     -            OK
         D     -            OK
```

The results above are for a connected Gigabit Ethernet cable (using all four pairs) in good condition.

When using Ethernet or Fast Ethernet cables (10BASE-T or 100BASE-T), pairs C and D physically do not exist as they are not needed for data transfer. In this case, TDR will report their status as ‘Open’ The same is seen when using a Fast Ethernet switchport (Which does not have pairs C and D connected internally).

Table 2: Example output from **show test cable-diagnostics tdr**

```
awplus#show test cable-diagnostics tdr

Port     Pair  Length        Status
-------------------------------------------------
1.0.1    A     -             OK
         B     -             OK
         C     5 +/- 2 m     Open
         D     6 +/- 2 m     Open
```

Some VoIP phones report a test result like the following for a PoE port independent of whether the phone is powered or not.

Table 3: Example output from **show test cable-diagnostics tdr**

```
awplus#show test cable-diagnostics tdr

Test status: Complete.
Port     Pair  Length        Status
-----------------------------------------
1.1.11   A     -             OK
         B     -             OK
         C     8 +/- 2 m     Short (within-pair)
         D     9 +/- 2 m     Short (within-pair)
```

Table 4: Cable termination status in output from **show test cable-diagnostics tdr**

STATUS	DEFINITION
OK	The pair is good and is terminated.
Open	The pair is not terminated.
Short (within-pair)	There is a short between the two wires of the pair.
Short (cross-pair)	There is a short between wires of different pairs.
Error	The test was unable to get a result. This error condition may occur when connecting to remote devices that issue idle traffic data when operating in the 10/100 M mode.

Troubleshooting Fiber and Pluggable Issues

Fiber cable can be vulnerable to damage. Patch panels and patch cables can be connected with the wrong type of fiber, fiber splices can become faulty and fiber cables can be cut accidentally.

Digital monitoring helps find fiber issues when links go down. It allows you to measure optical parameters for pluggables installed in a switch and to troubleshoot fiber issues.

Digital monitoring is available for the following transceiver types:

- Digital Optical Monitoring (DOM) for XFP (10 Gigabit Small Form Factor Pluggable) transceivers
- Digital Diagnostics Monitoring (DDM) for the following transceivers:
  - SFP (1 Gigabit Small Form-factor Pluggable),
  - SFP+ (10 Gigabit Small Form-factor Pluggable) and
  - QSFP+ (40 Gigabit Quad Small Form-factor Pluggable).

Different types of transceivers are supported in different models of switch. Contact your Allied Telesis distributor or reseller for more information about the particular models of pluggables that your switch supports, and if these transceivers also support digital monitoring.

To display information about transceivers installed on your switch, enter the following command:

```
awplus# show system pluggable diagnostics
```

The following parameters are measured and are displayed in **show system pluggable diagnostics** command output:

- Temperature (Centigrade) inside the transceiver
- Vcc (Volts)—voltage supplied to the transceiver
- Tx Bias (mA)—current to the Laser Diode in the transceiver
- Tx Power (mW)—the amount of light transmitted from the transceiver
- Rx Power (mW)—the amount of light received in the transceiver
- Rx LO—Loss of Signal—whether light is being received (Rx Up) and therefore the link is up, or light is not being received (Rx Down) and therefore the link is down

You can track Tx Bias to find out how the Laser Diode in the transceiver is aging by comparing the Tx Bias for one transceiver against Tx Bias for others. You can use this information to see if any transceivers may need replacement.

You can trouble shoot fiber connectivity issues by checking the Tx Power at one end of the fiber link against the Rx Power at the other end of the fiber link to measure the attenuation. Knowing the attenuation enables you to determine if there are anomalies in the fiber cable.

Note that Tx Power differences between the same type of transceivers installed on a switch may indicate that a transceiver is not seated or locked. Ensuring transceivers are seated and locked in place with the retaining clip will keep the fiber link up if there is any vibration or movement that can dislodge a fiber cable. Rx Power differences may indicate poor fiber patch cables, poor connectors or poor splices. Tracking Tx Bias for installed transceivers and measuring attenuation for fiber links allows you to perform periodic preventative maintenance, instead of reacting to a failure. Tracking Tx Power differences can be used as an indicator of failure in a transceiver which may need replacing.

The values for transceivers installed on your switch, can also be monitored using SNMP and the AT-PLUGGABLE-DIAGNOSTICS-MIB. This MIB is documented in the ‘Support for Allied Telesis Enterprise MIBs in AlliedWare Plus’ document.

Active Fiber Monitoring

The active fiber monitoring feature monitors fiber ports to see if the received optical power falls below a configurable baseline by a threshold amount. This may indicate physical bending of the fiber cable, which could arise when there is a physical intrusion. If this happens, the device can perform a configurable action.

Configuring active fiber monitoring

Step 1: Enable active fiber monitoring

To configure a port to monitor received power at the default intervals and sensitivity, use the commands:

```
awplus(config)# interface port1.0.1
awplus(config-if)# fiber-monitoring enable
```

By default, the interval is once every 5 seconds, the baseline value is calculated from the average of the last 12 readings, and the action is to generate a log message if the received power falls below the threshold by more than 1dB.

Step 2: Configure actions

By default, the device will generate a log message when the optical power has dropped below the alarm threshold for the port. Additional actions may be configured.

To send a notification to the configured SNMP trap host when the alarm threshold is crossed, use the commands:

```
awplus(config)# interface port1.0.1
awplus(config-if)# fiber-monitoring action trap
```

To shut down the port when the alarm threshold is crossed, use the commands:

```
awplus(config)# interface port1.0.1
awplus(config-if)# fiber-monitoring action shutdown
```

To both send a trap and shutdown the port, use the commands:

```
awplus(config)# interface port1.0.1
awplus(config-if)# fiber-monitoring action trap shutdown
```

The actions can be configured in the same command or in separate commands and in any order.

Step 3: Configure polling interval

The interval for polling received optical power is 5s by default, and can be configured from 2 - 60s. To poll the received power every 2 seconds instead of every 5 seconds, use the commands:

```
awplus(config)# interface port1.0.1
awplus(config-if)# fiber-monitoring interval 2
```

Step 4: To configure how the baseline is calculated

To calculate the baseline values based on the average of the last 30 readings instead of the last 12 readings (configurable from 12-150), use the commands:

```
awplus(config)# awplus(config)# interface port1.0.1
awplus(config-if)# fiber-monitoring baseline average 30
```

Caution: Setting a **fixed value is not recommended** because gradual change over time caused by baseline temperature fluctuations, etc. could lead to unnecessary alarms.

However, if you decide to use a fixed baseline value (e.g. with a value of 1000) rather than calculating an average, you can set it to a value in the range 1-65535 by using the commands:

```
awplus(config)# interface port1.0.1
awplus(config-if)# fiber-monitoring baseline fixed 1000
```

Step 5: Configure sensitivity

To configure the sensitivity of the alarm threshold, use the commands:

```
awplus(config)# interface port1.0.1
awplus(config-if)# fiber-monitoring sensitivity high
```

The sensitivity can be configured as a dB value (effectively a percentage change in power) or a fixed value, and there are a number of pre-defined options. A value that is too sensitive could cause unnecessary alarms. We do not recommend setting sensitivity to **highest** for multi-mode SFPs and **high** should be used with caution. The configured values and the values in the following table indicate the difference from the baseline value.

Table 5: Configurable values for optical power sensitivity

CONFIG VALUE	DB	FIXED (0.0001MW)	COMMENTS
low	2dB	-	
medium	1dB	-	default value
high	0.5dB	25	(whichever is larger)
highest	-	25	
fixed 50	-	50	configurable from 25-65535
relative 0.75	0.75dB	-	configurable from 0.00-10.00 dB

Step 6: Review configuration and status

To display the configuration and current status of active fiber monitoring, use the command:

```
awplus# show system fiber-monitoring
```

```
awplus# show system fiber-monitoring

Fiber Monitoring Status
  Reading units 0.0001mW

Stack member 1:

Interface port1.0.1
Status:           enabled
Supported:        Supported pluggable
Debugging:        disabled
Interval:         2 seconds
Sensitivity:      1.00dB
Baseline type:    average of last 35 values greater than 50
Status:
 Baseline value:   496
 Alarm threshold:  393
 Alarm:            no
 Last 12 Readings: 498 498 498 498 498 498 498 498 498 498 498 498
 Minimum reading: 486
 Maximum reading: 498
```

Table 6: Parameters in the output from **show system fiber-monitoring**

PARAMETER	Description
Reading units	The units for optical power readings in the rest of the display, e.g. 0.0001mW.
Status	Whether active fiber monitoring is enabled or disabled for this port.
Supported	Whether the pluggable inserted in this port supports active fiber monitoring.
Debugging	Whether debugging of active fiber monitoring is enabled or disabled for this port.
Interval	The configured interval between readings of optical power on this port.
Sensitivity	The configured sensitivity threshold for optical power changes on this port.
Baseline type	How the baseline optical power level is calculated: either the average of the specified number of previous readings or a specified fixed value in units of 0.0001mW.
Status	Current values for the following parameters.
Baseline value	The baseline value, calculated according to the configured baseline method, in units of 0.0001mW.
Alarm threshold	The current threshold for a change in optical power, calculated according to the configured sensitivity method, that will result in action.
Alarm	Whether the optical power at the most recent reading has dropped below the threshold.
Last 12 readings	The last 12 optical power values measured, in units of 0.0001mW, with oldest value first.
Minimum reading	The lowest optical power reading since the fiber pluggable was last inserted, or since active fiber monitoring was last enabled on the port.
Maximum reading	The highest optical power reading since the fiber pluggable was last inserted, or since active fiber monitoring was last enabled on the port.

Step 7: View optical power readings as they happen

Debugging can be enabled to show each optical power reading as it happens. To enable debugging for an interface, use the commands:

```
awplus# terminal monitor
awplus# debug fiber-monitoring interface port2.0.1
```

Example console output:

```
% Warning: Console logging enabled
awplus#01:42:50 awplus Pluggable[522]: Fiber-monitor port2.0.1:
Channel:1 Reading:1748 Baseline:1708 Threshold:1356
01:42:52 awplus Pluggable[522]: Fiber-monitor port2.0.1: Channel:1
Reading:1717 Baseline:1709 Threshold:1357
01:42:54 awplus Pluggable[522]: Fiber-monitor port2.0.1: Channel:1
Reading:1780 Baseline:1709 Threshold:1357
01:42:56 awplus Pluggable[522]: Fiber-monitor port2.0.1: Channel:1
Reading:1685 Baseline:1710 Threshold:1358
01:42:58 awplus Pluggable[522]: Fiber-monitor port2.0.1: Channel:1
Reading:1701 Baseline:1710 Threshold:1358
```

To disable debugging messages for active fiber monitoring on port 1.0.2, use the command:

```
awplus# no debug fiber-monitoring interface port 1.0.2
```

To disable all debugging messages for active fiber monitoring, use the command:

```
awplus# no debug fiber-monitoring
```

To disable all debugging messages for all features, use the command:

```
awplus# no debug all
```

Disabling active fiber monitoring

Step 1: Disable active fiber monitoring

To disable fiber-monitoring on a port, use the commands:

```
awplus# interface port1.0.1
awplus(config-if)# no fiber-monitoring enable
```

The latest state information will be kept, and will still be available in **show fiber-monitoring** command.

Step 2: Remove configuration and status

To remove all fiber-monitoring configuration and state information for a port, use the commands:

```
awplus# interface port1.0.1
awplus(config-if)# no fiber-monitoring
```


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