IBM

System z9 109 and @server® zSeries 890 and 990

Input/Output Configuration Program User's Guide for ICP IOCP

SB10-7037-04

System z9 109 and @server® zSeries 890 and 990

Input/Output Configuration Program User's Guide for ICP IOCP

SB10-7037-04

Note

Before using this information and the product it supports, be sure to read the information under "Safety and Environmental Notices" on page xiii and Appendix G, "Notices," on page G-1.

Fifth Edition (August 2005)

This edition, SB10-7037-04, applies to ICP IOCP Version 1 Release 3 Modification 0 (1.3.0) (batch and stand-alone versions). This edition replaces SB10-7037-03. A technical change to the text or illustration is indicated by a vertical line to the left of the change.

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Safety and Environmental Notices

Safety Notices

Safety notices may be printed throughout this guide. **DANGER** notices warn you of conditions or procedures that can result in death or severe personal injury. **CAUTION** notices warn you of conditions or procedures that can cause personal injury that is neither lethal nor extremely hazardous. **Attention** notices warn you of conditions or procedures that can cause damage to machines, equipment, or programs.

There are no **DANGER** notices in this guide.

World Trade Safety Information

Several countries require the safety information contained in product publications to be presented in their national languages. If this requirement applies to your country, a safety information booklet is included in the publications package shipped with the product. The booklet contains the safety information in your national language with references to the US English source. Before using a US English publication to install, operate, or service this IBM product, you must first become familiar with the related safety information in the booklet. You should also refer to the booklet any time you do not clearly understand any safety information in the US English publications.

Laser Safety Information

All System z9 and zSeries models can use I/O cards such as PCI adapters, ESCON, FICON, Open Systems Adapter (OSA), InterSystem Coupling-3 (ISC-3), or other I/O features which are fiber optic based and utilize lasers or LEDs.

Laser Compliance

All lasers are certified in the U.S. to conform to the requirements of DHHS 21 CFR Subchapter J for class 1 laser products. Outside the U.S., they are certified to be in compliance with IEC 60825 as a class 1 laser product. Consult the label on each part for laser certification numbers and approval information.

CAUTION:
Data processing environments can contain equipment transmitting on system links with laser modules that operate at greater than Class 1 power levels. For this reason, never look into the end of an optical fiber cable or open receptacle. (C027)

CAUTION:
This product contains a Class 1M laser. Do not view directly with optical instruments. (C028)

Environmental Notices

Product Recycling and Disposal

This unit must be recycled or discarded according to applicable local and national regulations. IBM encourages owners of information technology (IT) equipment to responsibly recycle their equipment when it is no longer needed. IBM offers a variety of product return programs and services in several countries to assist

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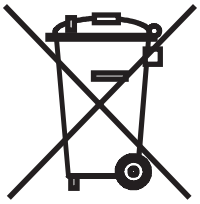
equipment owners in recycling their IT products. Information on IBM product recycling offerings can be found on IBM's Internet site at *http://www.ibm.com/ibm/environment/products/prp.shtml*.



Notice: This mark applies only to countries within the European Union (EU) and Norway.

Appliances are labeled in accordance with European Directive 2002/96/EC concerning waste electrical and electronic equipment (WEEE). The Directive determines the framework for the return and recycling of used appliances as applicable throughout the European Union. This label is applied to various products to indicate that the product is not to be thrown away, but rather reclaimed upon end of life per this Directive.

In accordance with the European WEEE Directive, electrical and electronic equipment (EEE) is to be collected separately and to be reused, recycled, or recovered at end of life. Users of EEE with the WEEE marking per Annex IV of the WEEE Directive, as shown above, must not dispose of end of life EEE as unsorted municipal waste, but use the collection framework available to customers for the return, recycling, and recovery of WEEE. Customer participation is important to minimize any potential effects of EEE on the environment and human health due to the potential presence of hazardous substances in EEE. For proper collection and treatment, contact your local IBM representative.

注意: このマークは EU 諸国およびノルウェーにおいてのみ適用されます。

この機器には、EU 諸国に対する廃電気電子機器指令 2002/96/EC(WEEE) のラベルが貼られています。この指令は、EU 諸国に適用する使用済み機器の回収とリサイクルの骨子を定めています。このラベルは、使用済みになった時に指令に従って適正な処理をする必要があることを知らせるために種々の製品に貼られています。

Remarque : Cette marque s'applique uniquement aux pays de l'Union Européenne et à la Norvège.

L'étiquette du système respecte la Directive européenne 2002/96/EC en matière de Déchets des Equipements Electriques et Electroniques (DEEE), qui détermine les dispositions de retour et de recyclage applicables aux systèmes utilisés à travers l'Union européenne. Conformément à la directive, ladite étiquette précise que le produit sur lequel elle est apposée ne doit pas être jeté mais être récupéré en fin de vie.

Refrigeration

These systems contain a modular refrigeration unit with R-134A refrigerant and a polyol ester oil. This refrigerant must not be released or vented to the atmosphere. Skin contact with refrigerant may cause frostbite. Wear appropriate eye and skin protection. Modular refrigeration units are sealed and must not be opened or maintained.

Battery Return Program

This product may contain sealed lead acid, nickel cadmium, nickel metal hydride, lithium, or lithium ion battery(s). Consult your user manual or service manual for specific battery information. The battery must be recycled or disposed of properly. Recycling facilities may not be available in your area. For information on disposal of batteries outside the United States, go to *http://www.ibm.com/ibm/environment/products/batteryrecycle.shtml* or contact your local waste disposal facility.

In the United States, IBM has established a return process for reuse, recycling, or proper disposal of used IBM sealed lead acid, nickel cadmium, nickel metal hydride, and other battery packs from IBM Equipment. For information on proper disposal of these batteries, contact IBM at 1-800-426-4333. Please have the IBM part number listed on the battery available prior to your call.

In Taiwan, the following applies:

Please recycle batteries 廢電池請回收

IBM Cryptographic Coprocessor Card Return Program

This machine may contain an optional feature, the cryptographic coprocessor card, which includes a polyurethane material that contains mercury. Please follow Local Ordinances or regulations for disposal of this card. IBM has established a return program for certain IBM Cryptographic Coprocessor Cards. More information can be found at *http://www.ibm.com/ibm/environment/products/prp.shtml*.

برنامج ارجاع كرت IBM Cryptographic Coprocessor

هــذه الماكيــنة قد تحتــوي على خاصــية اختيارية، وهى كــارت
Cryptographic Coprocessor
والتي تحتــوي على مـــادة بولــييوريثيـــن التي تحتــوي على الزئبــق
رجـــــاء اتبــاع القوانيــن أو التعليمــات المحــلية للتخــلص من هــذا الكـــارت .
قامــت شركة IBM باعداد برنامج لارجاع بعض كــروت IBM Cryptographic
Coprocessor

لمزيد من المعلومات، رجاء زيارة الموقع
http://www.ibm.com/ibm/environment/products/prp.shtml

Cable Warning

WARNING: Handling the cord on this product or cords associated with accessories sold with this product, will expose you to lead, a chemical known to the State of California to cause cancer, and birth defects or other reproductive harm. ***Wash hands after handling.***

Summary of Changes

Summary of Changes for SB10-7037-04
System z9 109 and zSeries® 890 and 990
Input/Output Configuration Program User's Guide ICP IOCP

This major revision contains technical and editorial changes.

New Information:

- New ICP IOCP release level (stand-alone and batch versions): ICP IOCP Version 1 Release 3.0
- Support for the 2094 models (see Appendix F, "Machine Limits and Rules.")
- Support for the OSA for network control program (NCP) channel paths (TYPE=OSN)
- Support for two subchannel sets within a CSS, using the new SCHSET keyword on the IODEVICE statement
- IOCP uses a variable amount of storage based on the type of IOCDS it is processing (see Table F-3 on page F-5).

Summary of Changes for SB10-7037-03
zSeries Input/Output Configuration Program User's Guide ICP IOCP

This minor revision contains technical and editorial changes.

New Information:

- Increase the number of FCV, FC, FCP, OSC, OSD, and OSE channels available on 2084 and 2086 models (see Table F-3 on page F-5).

Summary of Changes for SB10-7037-02
zSeries Input/Output Configuration Program User's Guide ICP IOCP

This major revision contains technical and editorial changes.

New Information:

- Special privileges have been added for unit addresses 'FC' and 'FD' on an FCP channel path. See "Fibre Channel Protocol Support" on page 1-28.
- Support for multiple control units on an OSD channel path so a single logical partition can have more than 254 devices (84 TCP/IP stacks).
- Support for 1920 valid subchannels (640 TCP/IP stacks) on OSA-Express2 OSD channel paths when priority specification is disabled. See "OSA Configuration Considerations" on page 1-25.

Summary of Changes for SB10-7037-01
zSeries Input/Output Configuration Program User's Guide ICP IOCP

This major revision contains technical and editorial changes.

New Information:

- New ICP IOCP release level (stand-alone and batch versions): ICP IOCP Version 1 Release 2.0
- Support for the 2086 models (see Appendix F, "Machine Limits and Rules," on page F-1)

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- Support for OSA-Express integrated console controller channel paths (TYPE=OSC)
- Reserved logical partitions can be specified which do not exist until a dynamic I/O configuration change is made to define them
- A null device candidate list can be specified for a CSS which excludes the device from the CSS
- The following channel path types can now be spanned across multiple CSSs: FC, FCP, CFS, CFP, CBS, CBP, OSC, OSD, and OSE.

Summary of Changes for SB10-7037-00a
zSeries Input/Output Configuration Program User's Guide ICP IOCP

This minor revision contains technical and editorial changes.

New Information:

- Hexadecimal value for Spanned ICP or IQD channel paths (See Table F-6 on page F-9).

Summary of Changes for SB10-7037-00
zSeries Input/Output Configuration Program User's Guide ICP IOCP

This is the initial edition of this publication.

New Information:

- New ICP IOCP release level (stand-alone and batch versions): ICP IOCP Version 1 Release 1.0
- Support for the 2084 models (See Appendix F, "Machine Limits and Rules," on page F-1)

Preface

This user's guide describes the Input/Output Configuration Program (ICP IOCP) that supports multiple logical channel subsystems for 2084, 2086, and 2094 CPCs. It is intended for system programmers and service representatives who are responsible for defining, installing, and configuring the channel paths, control units, and I/O devices on IBM® CPCs that require ICP IOCP.

Table 1. EC Levels That ICP IOCP Supports

Supported Models	EC Level
System z9™ 109 - 2094	All EC levels
zSeries 990 - 2084	All EC levels
zSeries 890 - 2086	All EC levels
Legend: System z9 109 - 2094: Models S08, S18, S28, S38, and S54 zSeries 990 - 2084: Models A08, B16, C24, and D32 zSeries 890 - 2086: Model A04	

This user's guide assumes the reader has a knowledge of the CPCs that support the characteristics of their I/O resources.

Use IOCP to define I/O configuration data the CPC requires to control I/O requests. This user's guide does not include information on how to configure I/O resources, but only on how to define the configuration by using IOCP.

Note: For information describing the IBM ESCON® and FICON® channel-to-channel (CTC) implementation, see the *ESCON and FICON Channel-to-Channel Reference*, SB10-7034.

What Is Included in This User's Guide

This user's guide contains the following:

- Chapter 1, "IOCP Introduction" presents an overview of IOCP and the I/O configuration process.
- Chapter 2, "IOCP Statements and Functions" describes IOCP statements, how to code them, and IOCP functions.
- Chapter 3, "Running the z/OS Version of IOCP" explains how to run IOCP under control of the z/OS® system control program.
- Chapter 4, "Running the VM Version of IOCP" explains how to run IOCP under a VM system control program.
- Chapter 5, "Running the VSE Version of IOCP" explains how to run IOCP under control of the VSE system control program.
- Chapter 6, "Running the Stand-Alone Version of IOCP" describes how to run IOCP from the Hardware Management Console.
- Chapter 7, "IOCP Configuration Reports" shows the configuration reports that IOCP produces.
- Chapter 8, "IOCP Messages" lists the messages (with the prefix ICP and DMSICP) that IOCP sends.

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The appendixes in this user's guide are:

- Appendix A, "Coding IOCP Statements" describes the rules for coding IOCP statements and the notation this document uses to show the syntax of the statements.
- Appendix B, "Lists of Statement Input" shows sample lists of IOCP input files.
- Appendix C, "Characteristics of the I/O Interface Timeout Function" contains detailed information about the timeout function.
- Appendix D, "List of I/O Devices and Control Units" shows the IOCP keyword values to specify in the IODEVICE and CNTLUNIT statements.
- Appendix E, "Configuration Examples" shows several figures and their accompanying IOCP input files that illustrate I/O configuration examples.
- Appendix F, "Machine Limits and Rules" lists the machine limits and rules for the different CPCs on which IOCP can run.
- Appendix G, "Notices" defines terms and abbreviations used in this user's guide.

Related Documents

The following documents contain information on topics related to IOCP.

OS/390®

- *OS/390 Hardware Configuration Definition Planning*, GC28-1750, explains the concepts, actions, and general planning considerations needed to define and maintain an I/O configuration using the Hardware Configuration Definition (HCD).
- *OS/390 Hardware Configuration Definition User's Guide*, SC28-1848, explains, along with online information, how to use HCD to define I/O configurations and eligible device tables to OS/390.
- *OS/390 Hardware Configuration Definition Scenarios*, SC28-1850, contains about 20 scenarios of common hardware configuration tasks.
- *OS/390 Hardware Definition Configuration Messages*, GC28-1849.
- *OS/390 HCD Reference Summary*, SX22-0043, provides a short overview of HCD tasks, navigation options, and information about online help. It also describes the relations among the configuration objects and lists the actions and action codes for each object.
- *MVS/ESA HCD and Dynamic I/O Reconfiguration Primer*, SG24-4037.

z/OS and z/OS.e

- *z/OS Hardware Configuration Definition Planning*, GA22-7525, explains the concepts, actions, and general planning considerations needed to define and maintain an I/O configuration using the Hardware Configuration Definition (HCD).
- *z/OS Hardware Configuration Definition User's Guide*, SC33-7988, explains, along with online information, how to use HCD to define I/O configurations and eligible device tables to z/OS.
- *z/OS Hardware Configuration Definition Scenarios*, SC33-7987, contains about 20 scenarios of common hardware configuration tasks.
- *z/OS Hardware Configuration Definition Messages*, SC33-7986.
- *z/OS and z/VM Hardware Configuration Manager User's Guide*, SC33-7989.
- *z/OS HCD Reference Summary*, SX33-9032, provides a short overview of HCD tasks, navigation options, and information about online help. It also describes the relations among the configuration objects and lists the actions and action codes for each object.

z/VM®

- *z/VM General Information*, GC24-5944, describes the features of z/VM.
- *z/VM Planning and Administration*, SC24-5948, describes how to generate a z/VM system on CPC and perform dynamic I/O configuration changes.
- *z/VM CP Command and Utility Reference*, SC24-5967, describes the IOCP CMS utility.
- *z/VM Dynamic I/O Configuration Planning and Administration*, SC24-6044, describes the use of the Hardware Configuration Definition (HCD).
- *z/OS and z/VM Hardware Configuration Manager User's Guide*, SC33-7989.

VSE/ESA™

- *VSE/Enterprise Systems Architecture General Information*, GC33-6501, describes the features of VSE/ESA.
- *VSE/Enterprise Systems Architecture Planning*, SC33-6503, for more information on how to set up a VSE/ESA system on a CPC.
- *VSE/Enterprise Systems Architecture System Control Statements*, SC33-6513.

z/VSE

- *z/VSE Planning*, SC33-8221.
- *z/VSE System Control Statements*, SC33-8225.

2084 Models

- *zSeries 990 System Overview*, SA22-1032.
- *zSeries 890 and 990 Processor Resource Systems Manager Planning Guide*, SB10-7036.
- *zSeries 890 and 990 Stand-Alone IOCP User's Guide*, SB10-7040.
- *Hardware Management Console Operations Guide*, SC28-6819.
- *zSeries 990 Support Element Operations Guide*, SC28-6820.
- *zSeries 990 Installation Manual for Physical Planning*, GC28-6824.

2086 Models

- *zSeries 890 System Overview*, SA22-6832.
- *zSeries 890 and 990 Processor Resource Systems Manager Planning Guide*, SB10-7036.
- *zSeries 890 and 990 Stand-Alone IOCP User's Guide*, SB10-7040.
- *Hardware Management Console Operations Guide*, SC28-6830.
- *zSeries 890 and 990 Support Element Operations Guide*, SC28-6831.

2094 Models

- *System z9 109 System Overview*, SA22-6833.
- *System z9 109 Processor Resource Systems Manager Planning Guide*, SB10-7041.
- *System z9 109 Stand-Alone Input/Output Configuration Program User's Guide*, SB10-7152.
- *Hardware Management Console Operations Guide*, SC28-6821.
- *System z9 109 Support Element Operations Guide*, SC28-6845.
- *System z9 109 Installation Manual for Physical Planning*, GC28-6844.

Enterprise Systems Connection (ESCON)

- *Introducing Enterprise Systems Connection*, GA23-0383.
- *Introducing ESCON Directors*, GA23-0363.
- *Planning for Enterprise Systems Connection Directors*, GA23-0364.
- *ESCON and FICON Channel-to-Channel Reference*, SB10-7034.
- *Planning for the 9032 Model 5 Director with FICON Converter Feature*, SA22-7415.

Fibre Connection (FICON)

- *Introduction to IBM S/390 FICON*, SG24-5176.
- *Planning for the 9032 Model 5 Director with FICON Converter Feature*, SA22-7415.
- *ESCON and FICON Channel-to-Channel Reference*, SB10-7034.
- *Configuration Utility for FCP LUN Access Control User's Guide*, SC33-8280.

Open Systems Adapter (OSA)

- *Open Systems Adapter-Express Customer's Guide and Reference*, SA22-7935.
- *OS/390 Open Systems Adapter Support Facility Users Guide*, SC28-1855.
- *VSE/Enterprise Systems Architecture Open Systems Adapter Support Facility Users Guide*, SC28-1946.
- *Open Systems Adapter-Express Integrated Console Controller User's Guide*, SA22-7990.

Note to All Users

This user's guide describes ICP IOCP. See Appendix F, "Machine Limits and Rules" for a list of the processor models that require ICP IOCP. Note that any IOCDS that ICP IOCP creates runs only on the processor models listed there. Also, note that you cannot use ICP IOCP to print reports or read IOCDSs produced by IYP IOCP, IZP IOCP, or IXP IOCP.

IOCP requires a maximum of 73MB of storage to run on z/OS and VSE (MB equals 1 048 576 bytes). On VM, IOCP uses 73MB of storage in a CMS virtual machine. IOCP requires a variable amount of storage based on the type of IOCDS it is processing. To determine the amount of storage IOCP requires for a specific type of processor, see Table F-3 on page F-5.

When you perform any IOCP function, the z/OS IOCP program must be an APF-authorized program.

Summary of Differences Between ICP IOCP and IYP IOCP

There are several differences between ICP IOCP and IYP IOCP.

ICP IOCP includes enhancements that allow you to define new sets of controls for CPCs. These enhancements affect the way you define logical partitions, channel paths, control units, and devices.

Logical Partition Definition:

- Partition numbers are called MIF (Multiple Image Facility) image ID or MIF ID numbers.

- You can specify reserved logical partitions that do not exist until a dynamic I/O configuration change defines them.
- Logical partitions are assigned to logical channel subsystems (CSSs).
- RESOURCE statement is required.

Channel Path Definition

- Keyword PCHID is required for physical channel paths to specify the physical channel ID associated with a channel path. The physical channel ID identifies the physical location (cage, slot, card port) for a channel path in the CPC. This is a new keyword.
- Only one channel path can be defined in a CHPID statement instead of up to 8 channel paths.
- The optional CHPARM keyword replaces optional keyword OS. Keyword CHPARM specifies information to associate with a channel path. Although the OS keyword is currently accepted, IOCP will disallow it in the future.
- Parameter CSS is on PATH, CPATH, PARTITION, PART, and NOTPART keywords to identify the CSSs with which the keyword parameters are associated.
- The following channel path types are supported:
  - OSN channel paths with ICP IOCP 1.3.0
  - OSC channel paths with ICP IOCP 1.2.0.

Control Unit Definition

- Parameter CSS is on PATH and LINK keywords to identify the CSSs with which the keyword parameters are associated.
- The CUADD keyword is allowed for control units assigned to OSD channel paths.

Device Definition

- IOCP ignores the PATH keyword on the IODEVICE statement for devices assigned to CTC, OSD, OSE, FCP, or IQD channel paths.
- Parameter CSS is on PATH, PARTITION, PART, and NOTPART keywords to identify the CSSs with which the keyword parameters are associated.
- A null device candidate list can be specified for a CSS by using the PART, PARTITION, or NOTPART keywords; doing so excludes the device from the CSS.
- An optional keyword SCHSET can be specified to identify the subchannel set within a CSS to which the device belongs.

Other Differences Between ICP IOCP and IYP IOCP

- Only LPAR mode IOCDSs are supported. LPAR=NO in the PARM parameter of the EXEC statement for z/OS and VSE and the CMS option NOLPAR are not allowed. Although LPAR=YES and LPAR are currently accepted, IOCP will disallow them in the future.
- IOCP now requires a maximum of 73MB of storage to run (MB equals 1 048 576 bytes).
- For an IOCDS capable of dynamic I/O configuration, keyword MAXDEV on the RESOURCE statement specifies the maximum number of devices that can be defined in the configuration including dynamically added devices.
- Significant differences exist in IOCP reports.

- Logical control units are called control unit headers.

How to Send Your Comments

Your feedback is important in helping to provide the most accurate and high-quality information. Send your comments by using Resource Link at *http://www.ibm.com/servers/resourcelink*. Select **Feedback** on the Navigation bar on the left. Be sure to include the name of the book, the form number of the book, the version of the book, if applicable, and the specific location of the text you are commenting on (for example, a page number or table number).

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In This Chapter

This chapter presents an overview of the following topics:

- Hardware I/O configuration
- I/O configuration process
- I/O configuration data sets (IOCDSs)
- I/O configuration considerations
- Shared ESCON CTC considerations
- Coupling facility support
- Open Systems Adapter (OSA) feature support
- Internal Queued Direct Communication (HiperSockets™) support
- Fibre Channel protocol support
- Defining FICON switch configurations
- Managing logical paths for ESCON and FICON channels
- Managing the establishment of logical paths
- Channel path selection
- Channel unit types
- Versions of IOCP

Hardware I/O Configuration

In the CPC, the input/output (I/O) subsystem, which controls channel operations, requires specific data about the hardware I/O configuration.

To define the I/O configuration for the I/O subsystem, run the Input/Output Configuration Program (IOCP). To run IOCP, you need to specify:

- Logical partitions
- Channel paths on the central processor complex (CPC) and their assignment to logical partitions
- Control units attached to the channel paths
- I/O devices assigned to the control units

Also, to meet changing I/O requirements, you can replace an existing I/O configuration with a new configuration by running IOCP.

All control units and I/O devices that attach to the CPC must be defined to the channel subsystem by using IOCP.

See Appendix D, “List of I/O Devices and Control Units,” on page D-1 for a partial list of control units and I/O devices available.

Note: Your CPC may not support all the devices listed in Appendix D, “List of I/O Devices and Control Units,” on page D-1.

2084 and 2086 Models

This figure shows the major components of the input/output (I/O) subsystem for 2084 and 2086 models and suggests ways to configure I/O for maximum availability.

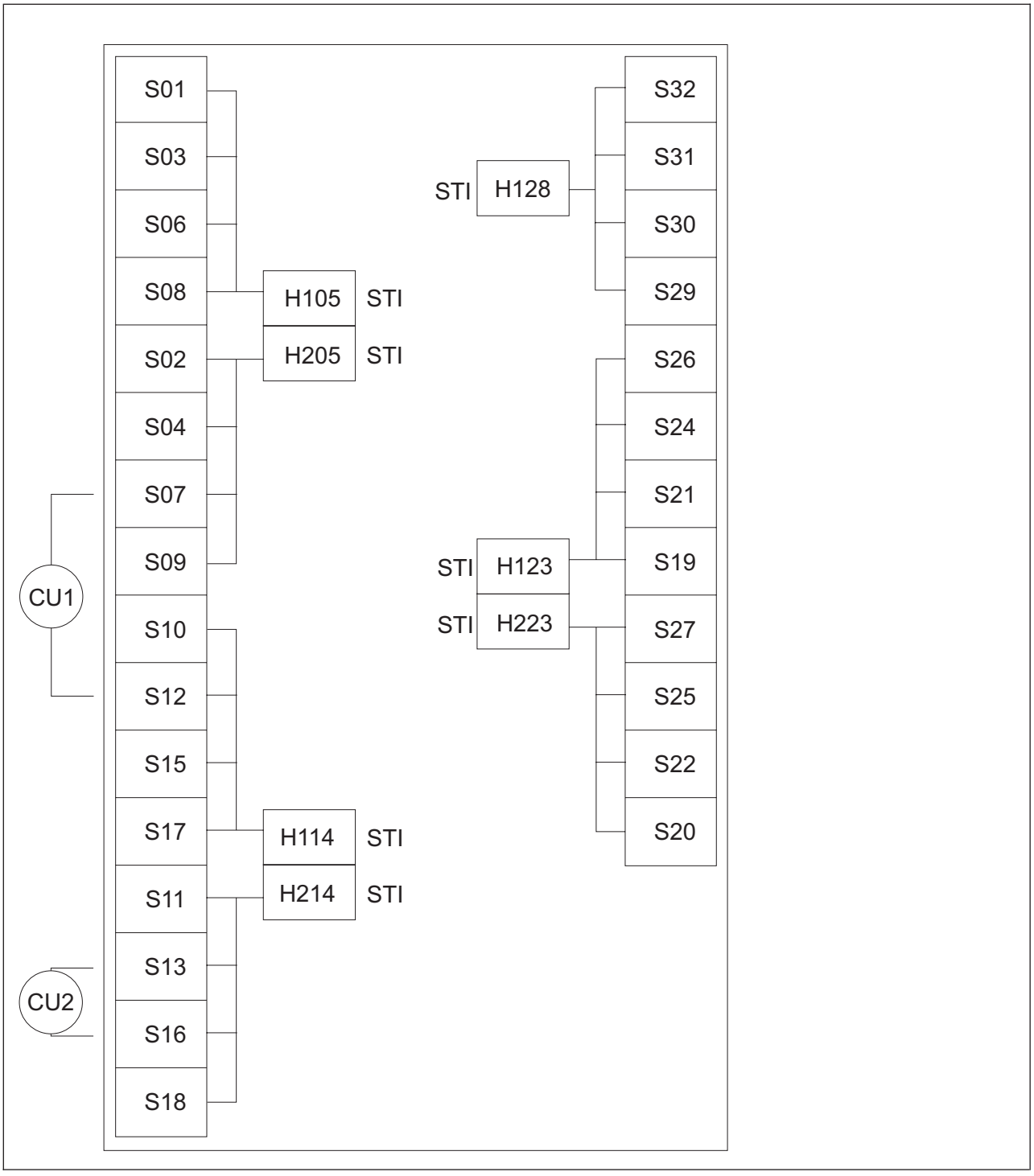


Figure 1-1. I/O Channel Path Configuration for a Representative I/O Cage in a 2084 or 2086 Model

Legend

STI Self-timed interface

H1 Half-high card in top half of slot

H2 Half-high card in bottom half of slot

S Slot

Availability Guidelines for 2084 and 2086 Models

When configuring devices with multiple paths to the same CPC, select any of the channel paths shown in Figure 1-2 on page 1-7 that:

- Are available on the CPC you are defining
- Are the correct type (ESCON, FICON, and so forth) to meet the control unit, coupling facility, or network attachment requirements
- Satisfy the rules regarding the mixing of channel types to a control unit.

However, for maximum availability of the device, OSA network, or coupling facility on a 2084 or 2086 model you should consider the following guidelines. Note that 2086 models have a maximum of one I/O cage and one book.

- For systems with multiple I/O cages, distribute paths across the I/O cages (not shown). When choosing which self-timed interfaces (STIs) to use in different cages, use the guidelines in the following bullet.
- For systems with multiple STIs, distribute paths across the STIs (see CU 1).

  Note: We also recommend this for optimum performance of your most heavily-used I/O devices.

  When choosing the STIs to use, whether from different cages or the same cage, consider using a combination of STIs from different books. When you must use STIs from the same book, try to use STIs from different MBAs on that book. Refer to Table 1-2 on page 1-12 or your PCHID Report to determine which STI links belong to which MBAs on a book. If you have multiple paths to the device and multiple domains available that have the correct channel type, spreading the paths across as many books and MBAs as possible is also advisable.

  Connecting your critical devices this way will ensure access to those devices while running in a degraded mode. In the unlikely event of an MBA or book failure, you may be able to take advantage of running degraded until the repair.

  When configuring ICB or coupling CHPIDs for the same target CPC or coupling facility, use a combination of STIs from different books and different MBAs on those books. This allows for continued connectivity if you have to run degraded after a book or MBA failure.

  When configuring ICB-2 or ICB-3 channel paths for the same target CPC or coupling facility, use links that originate from different STI cards in the I/O cage. This eliminates the STI card as a single point of failure.
- If you define multiple paths from the same STI, distribute paths across different channel cards (see CU 2). Also, if you define multiple coupling facility channels to the same coupling facility or to the same ESA image, distribute paths across different coupling facility channel adapter cards or different coupling facility daughter cards.

Note: Each example in Figure 1-2 on page 1-7 is only an attempt to illustrate an availability guideline and does not represent an overall optimal configuration.

2084 processors automatically balance installed channel cards across all available system assist processors (SAPs). The processor attempts to assign an equal number of each channel card type (ESCON, FICON, and so forth) in each available SAP. While all channels on a given I/O card will always be in the same SAP, it is not predictable which I/O cards will be assigned to which SAPs. IBM recommends you configure for normal RAS as described in the preceding paragraphs, and the machine will balance the channels across your available SAPs. 2086 models have a single SAP so all I/O is performed by that SAP.

The following table illustrates the relationship between the book jack numbers and the MBA that supports those STIs.

Table 1-1. Relationship of Book Jack Numbers to MBAs

Book Jack Numbers	MBA
J00, J01, J02, J03	MBA-0
J04, J05, J06, J07	MBA-1
J08 J09, J10, J11	MBA-2

2094 Models

This figure shows the major components of the input/output (I/O) subsystem for 2094 models and suggests ways to configure I/O for maximum availability.

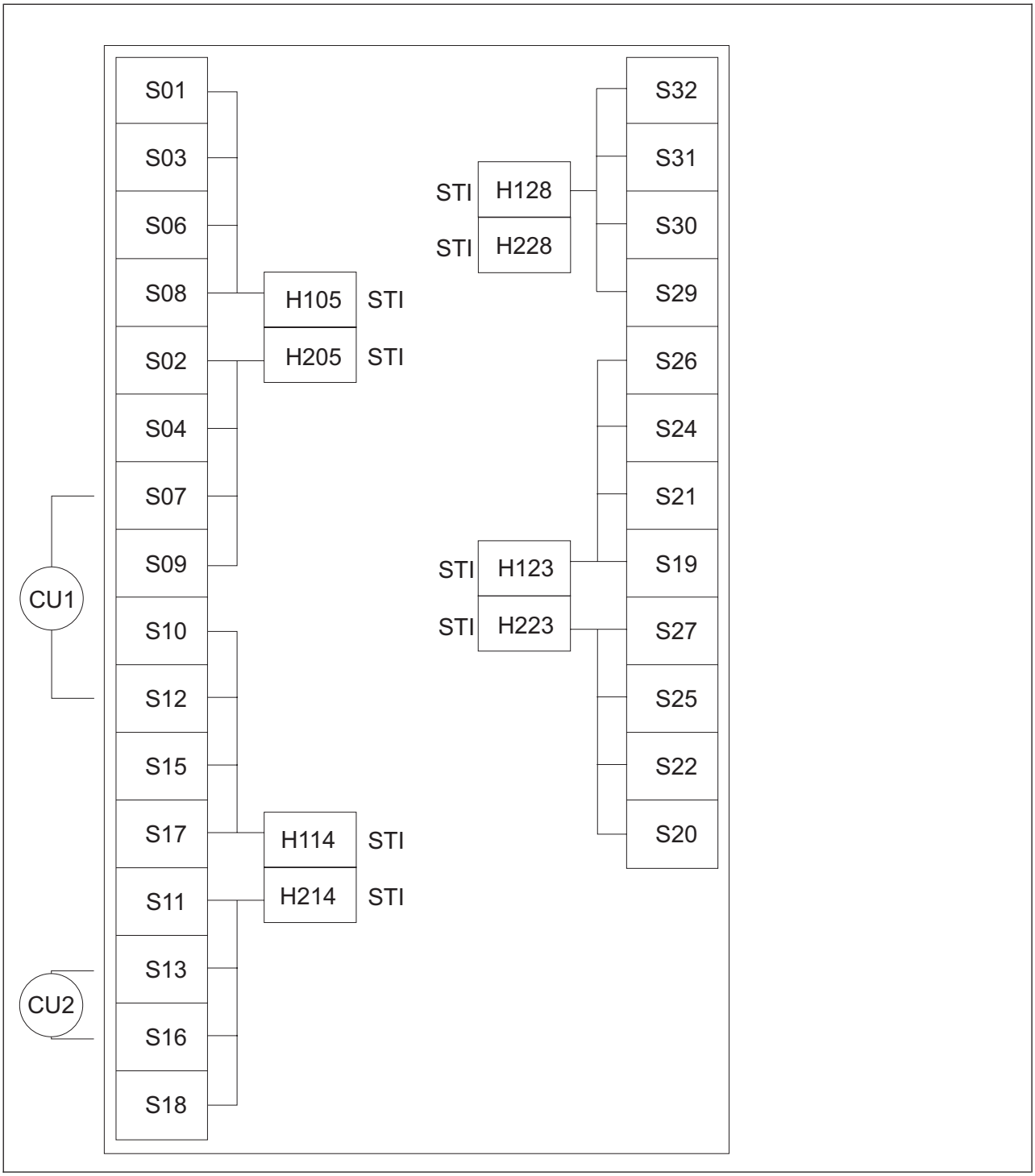


Figure 1-2. I/O Channel Path Configuration for a Representative I/O Cage in a 2094 Model

Legend

STI Self-timed interface

H1 Half-high card in top half of slot

H2 Half-high card in bottom half of slot

S Slot

Availability Guidelines for 2094 Models

When configuring devices with multiple paths to the same CPC, select any of the channel paths shown in Figure 1-2 on page 1-7 that:

- Are available on the CPC you are defining
- Are the correct type (ESCON, FICON, and so forth) to meet the control unit, coupling facility, or network attachment requirements
- Satisfy the rules regarding the mixing of channel types to a control unit.

However, for maximum availability of the device, OSA network, or coupling facility on a 2094 model, you should consider the following guidelines.

- Choose channels plugged in different I/O domains (see CU 1). An I/O domain contains four channel cards controlled by a single STI-MP card. For example, the domain for the STI-MP card in H105 contains slots 01, 03, 06, and 08.

  Note: We also recommend this for optimum performance of your most heavily-used I/O devices.

  When choosing the I/O domains to use, whether from different cages or the same cage, consider using a combination of I/O domains from different books. When you must use STIs from the same book, try to use STIs from different MBA fanout cards on that book. Each fanout card plugged into a book provides an MBA. Refer to your PCHID Report to determine which STI links belong to which MBA fanout cards on a book. If you have multiple paths to the device and multiple domains available that have the correct channel type, spreading the paths across as many books and MBAs as possible is also advisable.

  Redundant I/O Interconnect is a function that allows one STI to back up another STI in case of a failure. The STIs in slot 05 (same is true for those in slots 14, 23, and 28) back up each other. Therefore, in the event of an STI cable, fanout card, or book failure, the surviving STI will control both domains. There are failures (for example, the STI-MP card) that may prevent the redundant takeover, which is why it is advisable to spread your paths over multiple domains.

  When configuring ICB channel paths for the same target CPC or coupling facility, use a combination of STIs from different books and different MBA fanout cards on those books. This allows for continued connectivity if you have to run degraded after a book or MBA fanout card failure.

  When configuring ICB-3 channel paths for the same target CPC or coupling facility, use links that originate from different STI-3 extender cards in the I/O cage. This eliminates the STI-3 card as a single point of failure.
- If you define multiple paths from the same STI, distribute paths across different channel cards (see CU 2). Also, if you define multiple coupling facility channels to the same coupling facility or to the same ESA image, distribute paths across different coupling facility channel adapter cards or different coupling facility daughter cards.

Note: Each example in Figure 1-2 on page 1-7 is only an attempt to illustrate an availability guideline and does not represent an overall optimal configuration.

2094 processors automatically balance installed channel cards across all available system assist processors (SAPs). The processor attempts to assign an equal number of each channel card type (ESCON, FICON, and so forth) to each available SAP. While all channels on a given I/O card will always be in the same SAP, it is not predictable which I/O cards will be assigned to which SAPs. IBM recommends you configure for normal RAS as described in the preceding paragraphs, and the machine will balance the channels across your available SAPs.

Using a PCHID Report to Help Plan Your I/O Configuration

When planning an I/O configuration, the PCHID Report from the Order Process Configurator (e.Config) is a valuable aid.

Use the following information to relate this report to the availability guidelines presented in “Availability Guidelines for 2084 and 2086 Models” on page 1-5 and “Availability Guidelines for 2094 Models” on page 1-8.

- The Book/Jack/MBA column shows the book number and MBA number that the STI and channel card are serviced by. In the example, there are two books (0 and 1) and each MBA (0, 1, and 2) is used from each book. The PCHID Report for 2094 models reports 'Fanout' instead of 'MBA,' indicating the fanout slot where the MBA fanout card is plugged. Each fanout card contains an MBA.
- The Cage column indicates the number of cages installed and the location of the I/O and CPC cages containing I/O (CPC cages are shown only if ICB-4s are part of the configuration). In the example, there are three cages: a CPC cage in the top of the A-frame (A19B), an I/O cage in the bottom of the A-frame (A01B), and an I/O cage in the bottom of the Z-frame (Z01B).
- The Slot column shows the slot into which the channel card is plugged.
- The F/C column shows the feature code for the I/O type (ESCON, FICON, and so forth) installed in that location.
- The PCHID/Ports column shows the PCHID assignment and the physical port (jack number) on the card in the slot with that assignment.

Note: If you use the CHPID Mapping Tool, available from Resource Link, to aid you in assigning PCHIDs to CHPIDs, the tool will provide you with a new report with your CHPID assignment in addition to the PCHID values.

Following is an example of a PCHID Report.

Sample PCHID Report

```
CHPIDSTART
  10566931                      PCHID REPORT                        Apr 15, 2003
  Machine: 2084-B16  NEW1
  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
  Book/Jack/MBA    Cage  Slot  F/C    PCHID/Ports                      Comment
  0/J.11/2         A19B  06    3393   01B/J11

  1/J.11/2         A19B  10    3393   02B/J11

  0/J.00/0         A01B  D101  0218   100/J00 101/J01

  0/J.00/0         A01B  D201  0218   108/J00

  1/J.00/0         A01B  02    1366   110/J00 111/J01

  0/J.00/0         A01B  03    2319   120/J00 121/J01

  1/J.00/0         A01B  04    2319   130/J00 131/J01

  0/J.00/0         A01B  06    2323   140/J00 141/J01 142/J02 143/J03
                                      144/J04 145/J05 146/J06 147/J07
                                      148/J08 149/J09 14A/J10 14B/J11
                                      14C/J12 14D/J13

  1/J.00/0         A01B  07    2319   150/J00 151/J01

  0/J.00/0         A01B  08    2323   160/J00 161/J01 162/J02 163/J03
                                      164/J04 165/J05 166/J06 167/J07
                                      168/J08 169/J09 16A/J10 16B/J11
                                      16C/J12 16D/J13 16E/J14

  1/J.00/0         A01B  09    2323   170/J00 171/J01 172/J02 173/J03
                                      174/J04 175/J05 176/J06 177/J07
                                      178/J08 179/J09 17A/J10 17B/J11
                                      17C/J12 17D/J13 17E/J14

  0/J.04/1         A01B  10    2319   180/J00 181/J01

  1/J.09/2         A01B  11    2319   190/J00 191/J01

  0/J.04/1         A01B  12    2319   1A0/J00 1A1/J01

  1/J.09/2         A01B  13    2319   1B0/J00 1B1/J01

  0/J.04/1         A01B  15    2323   1C0/J00 1C1/J01 1C2/J02 1C3/J03
                                      1C4/J04 1C5/J05 1C6/J06 1C7/J07
                                      1C8/J08 1C9/J09 1CA/J10 1CB/J11
                                      1CC/J12 1CD/J13 1CE/J14

  1/J.09/2         A01B  16    2323   1D0/J00 1D1/J01 1D2/J02 1D3/J03
                                      1D4/J04 1D5/J05 1D6/J06 1D7/J07
                                      1D8/J08 1D9/J09 1DA/J10 1DB/J11
                                      1DC/J12 1DD/J13

  0/J.04/1         A01B  17    2323   1E0/J00 1E1/J01 1E2/J02 1E3/J03
                                      1E4/J04 1E5/J05 1E6/J06 1E7/J07
                                      1E8/J08 1E9/J09 1EA/J10 1EB/J11
                                      1EC/J12 1ED/J13 1EE/J14
```

Figure 1-3. Sample PCHID Report (Part 1 of 3)

```
1/J.09/2         A01B  18    2323   1F0/J00 1F1/J01 1F2/J02 1F3/J03
                                    1F4/J04 1F5/J05 1F6/J06 1F7/J07
                                    1F8/J08 1F9/J09 1FA/J10 1FB/J11
                                    1FC/J12 1FD/J13 1FE/J14

1/J.08/2         Z01B  D101  0218   300/J00 301/J01

1/J.08/2         Z01B  D201  0218   308/J00

0/J.08/2         Z01B  02    1366   310/J00 311/J01

1/J.08/2         Z01B  03    2319   320/J00 321/J01

0/J.08/2         Z01B  04    2319   330/J00 331/J01

1/J.08/2         Z01B  06    2319   340/J00 341/J01

0/J.08/2         Z01B  07    2319   350/J00 351/J01

1/J.08/2         Z01B  08    2323   360/J00 361/J01 362/J02 363/J03
                                    364/J04 365/J05 366/J06 367/J07
                                    368/J08 369/J09 36A/J10 36B/J11
                                    36C/J12 36D/J13 36E/J14

0/J.08/2         Z01B  09    2323   370/J00 371/J01 372/J02 373/J03
                                    374/J04 375/J05 376/J06 377/J07
                                    378/J08 379/J09 37A/J10 37B/J11
                                    37C/J12 37D/J13 37E/J14

1/J.04/1         Z01B  10    2319   380/J00 381/J01

0/J.01/0         Z01B  11    2319   390/J00 391/J01

0/J.01/0         Z01B  13    2319   3B0/J00 3B1/J01

1/J.04/1         Z01B  15    2323   3C0/J00 3C1/J01 3C2/J02 3C3/J03
                                    3C4/J04 3C5/J05 3C6/J06 3C7/J07
                                    3C8/J08 3C9/J09 3CA/J10 3CB/J11
                                    3CC/J12 3CD/J13 3CE/J14

0/J.01/0         Z01B  16    2323   3D0/J00 3D1/J01 3D2/J02 3D3/J03
                                    3D4/J04 3D5/J05 3D6/J06 3D7/J07
                                    3D8/J08 3D9/J09 3DA/J10 3DB/J11
                                    3DC/J12 3DD/J13

1/J.04/1         Z01B  17    2323   3E0/J00 3E1/J01 3E2/J02 3E3/J03
                                    3E4/J04 3E5/J05 3E6/J06 3E7/J07
                                    3E8/J08 3E9/J09 3EA/J10 3EB/J11
                                    3EC/J12 3ED/J13 3EE/J14

0/J.01/0         Z01B  18    2323   3F0/J00 3F1/J01 3F2/J02 3F3/J03
                                    3F4/J04 3F5/J05 3F6/J06 3F7/J07
                                    3F8/J08 3F9/J09 3FA/J10 3FB/J11
                                    3FC/J12 3FD/J13 3FE/J14

0/J.07/1         Z01B  29    0993   480/J01 481/J02

1/J.07/1         Z01B  30    0993   490/J01 491/J02

0/J.03/0         Z01B  31    0992   4A0/J01

1/J.03/0         Z01B  32    0992   4B0/J01
```

Figure 1-3. Sample PCHID Report (Part 2 of 3)

```
Legend:
  A19B    Top of A frame
  A01B    Bottom of A frame
  Z01B    Bottom of Z frame
  D1xx    Half high card in top of slot xx
  D2xx    Half high card in bottom of slot xx
  0218    ISC D <10KM
  1366    OSA Express 1000BASE T Ethernet
  2319    FICON Express LX
  2323    ESCON Channel 16 Ports
  3393    ICB 4 Function Enablement
  0993    ICB 3 Link
  0992    ICB Link
```

Figure 1-3. Sample PCHID Report (Part 3 of 3)

I/O Configuration Process

Specify I/O configuration data to IOCP by coding the data as card-image statements read from an input device. Use the following input devices depending on the version of IOCP:

Table 1-2. Input Device by IOCP Version

IOCP Version	Input Device
z/OS Version	Card deck, tape, and disk
VM Version	Card deck, tape, and disk
VSE Version	Card deck, tape, and disk
Stand-Alone Version	Diskette and support element console. You can modify cards by using a full-screen editor.

Although the input methods differ, IOCP performs the same process to build a configuration definition and to write reports. IOCP then stores the definition in an I/O configuration data set (IOCDS) on the support element hard disk. The IOCDS is used by the I/O subsystem.

Card-Image Input to IOCP

Code the following card-image statements and use them to define your I/O configuration data when you run IOCP. When IOCP processes these statements, it also produces reports that allow you to check the configuration.

Statement	Definition
ID	An optional statement that specifies identification information printed in the heading of IOCP configuration reports. It is the source of the customer name for the IOCDS. It is also the source of the customer name that displays on the Input/Output Configuration panel and on the Power-on Reset panel of the support element.
RESOURCE	A required statement that specifies the logical partitions and logical channel subsystems in the configuration.
CHPID	An optional statement that specifies the channel paths installed on the CPC.
CNTLUNIT	An optional statement that specifies the control units attached to the channel paths.

IODEVICE An optional statement that specifies the I/O devices assigned to the control units.

The IOCP statements are fully described under “Specifying IOCP Statements” on page 2-2.

Console Input to IOCP

When you run the stand-alone version of IOCP, use the full-screen editor to modify an existing IOCDS or generate a new one. For a full description of the stand-alone version of IOCP, see Chapter 6, “Running the Stand-Alone Version of IOCP,” on page 6-1.

I/O Configuration Data Sets

Use the I/O configuration data sets (IOCDSs) to store different I/O configuration definitions for your CPC.

The CPC has four IOCDS slots. The IOCDS slots are: A0, A1, A2, and A3. The IOCDS slots exist on the support element (SE) hard disk.

The configuration data in the IOCDS is accessed and transformed to a data format that the Licensed Internal Code (LIC) in the I/O subsystem uses when you perform a power-on reset by selecting Power-on Reset from the support element console or Hardware Management Console.

The I/O subsystem then controls I/O requests and uses the configuration data from the IOCDS that you specify for the power-on reset.

IOCP can read from any IOCDS produced by the version of IOCP covered in this document; however, IOCP can write only to an IOCDS that is not write-protected.

You can write-protect each IOCDS individually and remove write-protection when you want to alter an IOCDS by using the Input/Output Configuration panel on the support element. Write-protection prevents you from accidentally using IOCP to write over and destroy the configuration data in an IOCDS. Before writing an IOCDS, you must remove the write-protection from that IOCDS.

When defining a new configuration, you can do the following:

- Use the configuration in an existing IOCDS as your operating configuration
- Run IOCP to generate and write a new I/O configuration to another IOCDS
- Write-protect the new IOCDS
- Perform a power-on reset (POR) and use the new configuration to test the system.

Note: During the installation of a new CPC, the service representative can use any of the IOCDSs shipped with the CPC to perform initial POR.

IOCDSs and Processor Modes

IOCP creates IOCDSs for LPAR mode only. For a complete description of LPAR mode, see the *Processor Resource/Systems Manager Planning Guide*.

I/O Configuration Considerations

The IOCP generation process requires as input an I/O configuration input file containing IOCP statements. You can write an IOCDS with the z/OS, VM, VSE, or stand-alone version of IOCP.

Defining Multiple Logical Channel Subsystems

IOCP has been dramatically enhanced to allow the definition of an I/O configuration containing multiple, logical channel subsystems. A logical channel subsystem (CSS) is a complete definition of logical partitions, channels, control units, and devices as you might have defined for any previous processor. The difference with this level of IOCP and the processors it supports is that multiple CSSs may be defined with each CSS containing logical partitions, channels, control units, and devices. In addition, some processors now support multiple subchannel sets, which allows a CSS to have more than twice as many devices.

IOCP has added the CSS parameter to many traditional keywords to identify the logical channel subsystem to which the keyword parameters apply. IOCP has introduced a new keyword, SCHSET, to the IODEVICE statement to identify the subchannel set in a CSS to which a device belongs. See Chapter 2, "IOCP Statements and Functions," on page 2-1 for complete syntax rules for using the CSS parameter and specifying the SCHSET keyword. The following summarizes the new keywords and parameters in IOCP in support of multiple logical channel subsystems and multiple subchannel sets:

RESOURCE statement

Previously the RESOURCE statement defined the logical partitions (LPs) and associated partition numbers (now called MIF image IDs) to be included in the configuration. With this level of IOCP, you prefix those values with a CSS ID. The LPs and MIF image IDs are defined in the specified CSS.

Note: What was called "partition number" in previous levels of IOCP is now called MIF image ID. It retains all the same characteristics (for example, a hex number from 1-F), and is used the same for CTC control unit definitions. However, for processors that ICP IOCP supports, the MIF image ID is no longer used in the PARTITION keyword of the CF statement in the policy information defined for the site's coupling facility resource management (CFRM) policy. Instead, the "partition ID" that is specified on the activation profile for the CF image on the support element is used to identify the CF image.

CHPID statement

The PATH parameter has traditionally been used to mirror the CHPID number assigned by the processor to the actual channel that is being defined. With ICP IOCP and the processors it supports, the PATH parameter specifies a logical CHPID number of your choosing. The PATH parameter allows the user to specify the CSSs and the CHPID number that will be assigned to a channel path. If it is a physical channel (for example, FICON), the new PCHID keyword identifies the location of the physical channel in the processor. If it is an internal channel (for example, internal coupling or HiperSocket), the PCHID keyword is not allowed and the logical CHPID number is all that is required.

When a channel path is defined to multiple CSSs using the PATH parameter, the channel path is defined as spanned. The PARTITION or

NOTPART keywords may also use the CSS parameter to indicate which LPs can access the channel in each CSS to which the channel path is assigned.

CNTLUNIT statement
The PATH and LINK keywords may have a CSS parameter that indicates the logical CHPIDs from each CSS that have access to the control unit and the associated destination link address for each path.

IODEVICE statement
The PATH keyword may have a CSS parameter to indicate a preferred path from each CSS for the device. Likewise, the PARTITION or NOTPART keywords may have a CSS parameter to indicate a unique device candidate list for each CSS that has access to the device. The SCHSET keyword identifies the subchannel set in a CSS to which a device belongs; it may include a CSS parameter.

Note: If you are defining a single CSS configuration, the CSS parameter is optional.

Control Unit Headers

The I/O subsystem uses control unit headers to represent a set of physical control units that physically or logically attach I/O devices in common. For example, a logical channel subsystem can use the control unit header to establish a queue for I/O requests for the devices associated with the attaching physical control units.

Note: Control unit headers were previously called logical control units.

IOCP builds control unit headers from the information specified in the CNTLUNIT and IODEVICE statements. If a device attaches to more than one physical control unit, the physical control units form part of (or the whole of) a control unit header.

IOCP builds a control unit header for the following:

- Each physical control unit with no I/O devices attached.
- Each physical control unit that does not share any I/O devices with other physical control units.
- Each group of two or more control units that share devices between them.

Figure 1-4 on page 1-16 shows examples of valid control unit headers.

When a physical control unit or a group of control units that share devices between them have channel paths in multiple logical channel subsystems (CSSs), IOCP builds a control unit header (CUH) for each CSS. The CUH in each CSS contains only the channel paths from the physical control units associated with that CSS. The CUHs in each CSS are numbered independently of each other. The devices assigned to the physical control unit or group of control units become subchannels in each CSS and are numbered independently of each other. The subchannels in each CSS are associated with the CUH in the same CSS and its channel paths. In Figure 1-4 on page 1-16, CUH 3 is in CSS 0 with paths 01 and 02. CUH 19 is in CSS 1 with paths 21 and 24. A subchannel is generated in each CSS for device C. The subchannel in CSS 0 is associated with CUH 3 and the subchannel in CSS 1 is associated with CUH 19.

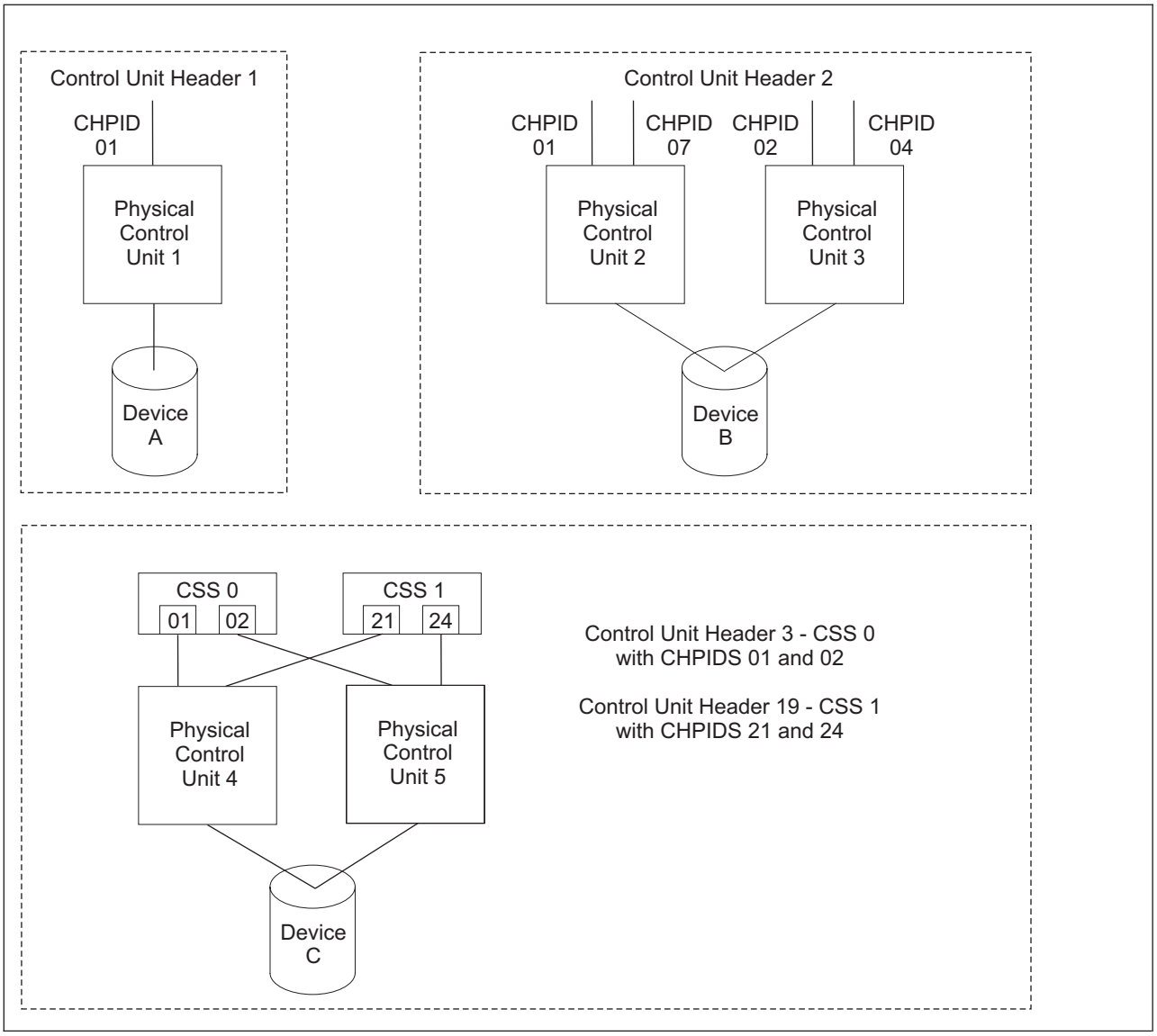


Figure 1-4. Valid Control Unit Headers

As it builds each control unit header, IOCP assigns a unique hexadecimal identifier to the control unit header in each CSS. It also ensures that the control unit header is valid and that it complies with all the following requirements:

- A maximum of eight physical control units are in one control unit header (CUH).
- A maximum of eight channel paths can attach to one CUH for each logical channel subsystem (CSS) in a CPC.
- Each occurrence of a channel path counts as one channel path.
- Only one control unit can belong to a CUH if the control unit is an ESCON CTC or FICON CTC control unit or the control unit attaches to a CFS, CFP, CBS, CBP, ICP, OSC, OSE, OSN, FCP, or IQD channel path.
- Only one channel path per CSS can belong to a CUH if the control unit is an ESCON CTC or FICON CTC or the control unit attaches to OSC, OSD, OSE, OSN, FCP, or IQD channel paths. If the control unit has channel paths in multiple CSSs, a CUH is built for each CSS with one path each.
- A physical control unit can belong to only one CUH in a CSS.

- Parallel physical control units within a CUH must all have the same characteristics (SHARED=Y or N; PROTOCL=D, S, or S4).
- All channel path types (TYPE keyword) attaching to a CUH must meet the following restrictions:
  - All CNC, FCV, or FC
  - All CFS or CBS
  - All CFP, CBP, or ICP
  - All CBY or CVC
  - All shared or all unshared (the SHARED, NOTPART, or PART or PARTITION keywords must be consistently specified for all channel paths).
- A maximum number of control unit headers cannot be exceeded for each CSS, depending on the CPC (see Appendix F, “Machine Limits and Rules,” on page F-1).

Figure 1-5 shows an example of a control unit header that is incorrect. Control unit header 5 is incorrect because the physical control units have a combined total of more than eight channel paths in a CSS.

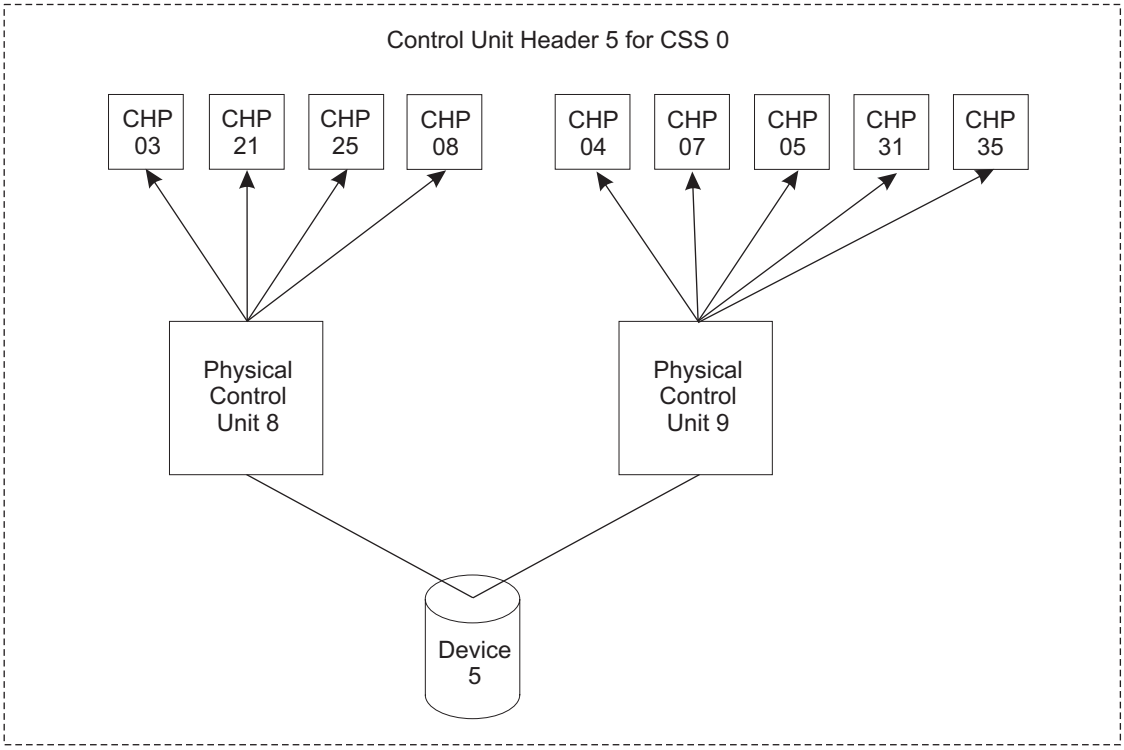


Figure 1-5. Control Unit Header That Is Incorrect

Shared ESCON CTC Considerations

IOCP can generate more unit addresses and unit address ranges for physical control units attaching to shared ESCON CTC channel paths than for other channel path types or unshared channel paths. This does not apply to FICON CTC control units.

Shared CTC Unit Address Ranges

IOCP calculates the number of unit address ranges for a shared CTC channel path by performing the following for each physical control unit attaching to the channel path:

- If a physical control unit has no devices, one unit address range is counted.
- If a physical control unit has devices, IOCP processes the candidate list for each device (determined by the PART, PARTITION, or NOTPART keyword in the IODEVICE statement). A device candidate list determines which logical partitions (LPs) can access the device. It can be independent of the candidate list for the CTC channel path assigned to the device. IOCP determines the number of unique LPs contained in the device candidate lists. This is the number of unit address ranges for the given physical control unit. The maximum number of unit address ranges for a shared ESCON CTC channel path is 120.

  If you do not specify the PART, PARTITION, or NOTPART keyword in an IODEVICE statement that is assigned to a shared CTC channel path, the device candidate list defaults to the LPs in the CTC channel path's candidate list. Because the maximum number of physical control units and unit address ranges for a shared CTC channel path are both 120, you will not be able to define 120 physical control units on a shared CTC channel path if one of its control units has more than one unit address range.

  To control the number of unit address ranges in a physical control unit assigned to a shared CTC channel path, do one or both of the following:

  – Specify a CHPID candidate list that contains only the LPs that will access the shared CTC channel path. If the CHPID candidate list does not contain all the LPs in the configuration, devices that do not specify a device candidate list have fewer unit address ranges for their physical control unit.

    For example, if your configuration has 10 LPs and a CTC channel path is shared by 5 LPs in its candidate list, each device assigned to the shared CTC channel path has a device candidate list that defaults to 5 LPs. The physical control unit assigned to the shared CTC channel path has 5 unit address ranges. Therefore, the maximum number of physical control units that you can define on the shared CTC channel path is only 24 instead of 120 because this configuration first reaches the maximum of 120 unit address ranges on the shared CTC channel path.

  – Specify a device candidate list for each device assigned to a physical control unit. If the device candidate lists of all the devices assigned to a physical control unit do not contain all the LPs in the configuration, fewer unit address ranges will be defined for the physical control unit.

    For example, if your configuration has 10 LPs and a CTC channel path is shared by all 10 LPs, each device assigned to the shared CTC channel path has a device candidate list that defaults to all 10 LPs. If you specify device candidate lists so that only 4 unique LPs can access any of the devices on a physical control unit, the control unit has 4 unit address ranges. Therefore, the maximum number of physical control units that you can define on the shared CTC channel path is only 30 instead of 120 because this configuration first reaches the maximum of 120 unit address ranges on the shared CTC channel path.

  You can increase the number of physical control units you can define on a shared CTC channel path up to the maximum of 120 by decreasing to one the number of unit address ranges on the control units assigned to the CTC channel path.

Shared CTC Unit Addresses

IOCP calculates the number of unit addresses for a shared ESCON CTC channel path by multiplying the number of unit addresses defined with the UNITADD keyword on the CNTLUNIT statement by the number of unit address ranges for the physical control unit (see “Shared CTC Unit Address Ranges” on page 1-18). The maximum number of unit addresses for a shared ESCON CTC channel path is 512. Because the maximum number of both unit addresses and devices for a shared CTC channel path is 512, you cannot define 512 devices on a shared CTC channel path if one of its control units has more than one unit address range.

For example, if your configuration has 8 LPs and a CTC channel path is shared by 4 LPs in its candidate list, each device assigned to the shared CTC channel path has a device candidate list that defaults to 4 LPs. The physical control unit assigned to the shared CTC channel path has 4 unit address ranges. The maximum number of unit addresses on the control unit is 128. Multiplying this by the 4 unit address ranges gives 512. Therefore, the maximum number of devices that you can define is only 128 because this configuration first reaches the maximum of 512 unit addresses on the shared CTC channel path.

You can also control the number of devices per shared CTC channel path by specifying a device candidate list for each device assigned to a control unit. But remember that the number of unit address ranges for a control unit is based on the number of unique LPs in all of the device candidate lists of the devices assigned to the control unit.

You can increase the number of unit addresses and devices you can define on a shared CTC channel path up to the maximum of 512 by decreasing to 1 the number of unit address ranges on each control unit assigned to the CTC channel path.

Coupling Facility Support

IOCP supports the following coupling facility channel paths (TYPE keyword):

- CFS
- CFR
- CFP
- CBS
- CBR
- CBP
- ICP.

See Appendix F, “Machine Limits and Rules,” on page F-1 to determine which channel path types your CPC supports. You define coupling facility channel paths at the coupling facility and at the central processor complexes (CPCs) or logical partitions (LPs) that connect to the coupling facility.

The coupling facility provides shared storage and shared storage management functions for the sysplex (for example, high speed caching, list processing, and locking functions). Applications running on z/OS images in the sysplex define the shared structures used in the coupling facility.

The coupling facility allows applications, running on multiple z/OS images that are configured in a sysplex, to efficiently share data so that a transaction processing workload can be processed in parallel across the sysplex.

PR/SM™ LPAR allows you to define the coupling facility, which is a special logical partition (LP) that runs the coupling facility control code. The coupling facility control code is Licensed Internal Code (LIC).

At LP activation, coupling facility control code automatically loads into the coupling facility LP from the support element hard disk. No initial program load (IPL) of an operating system is necessary or supported in the coupling facility LP.

Coupling facility control code runs in the coupling facility LP with minimal operator intervention. Operator activity is confined to the central processor complex (CPC) hardware operator console. PR/SM LPAR limits the hardware operator controls usually available for LPs to avoid unnecessary operator activity.

Coupling facility channel hardware provides the connectivity required for data sharing between the coupling facility and the CPCs directly attached to it. Coupling facility channels are point-to-point connections that require a unique channel definition at each end of the channel.

Coupling facility channels can also connect two coupling facilities together for a duplexing configuration. In this environment, coupling facility sender channels or coupling facility peer channels are configured to coupling facilities to support communication between the coupling facilities. The following coupling facility sections describe only ESA to coupling facility connections. However, they also apply to coupling facility duplexing connections (CF to CF).

Coupling Facility Channels

Coupling facility channels are channels that provide the connectivity for data sharing between a coupling facility and the CPCs or logical partitions (LPs) directly attached to it. IOCP provides controls for defining coupling facility channels. However, IBM recommends that, when possible, you use the Hardware Configuration Definition (HCD) to define the coupling facility channel configuration to the I/O subsystem.

HCD provides controls for defining coupling facility channels. HCD also automatically generates the control unit and device definitions associated with coupling facility sender and peer channel paths.

Coupling facility channels:

- Require a point-to-point connection (direct channel attach between a CPC or LP and a coupling facility).
- Can connect a coupling facility to other LPs on the same CPC when a coupling facility is one of multiple LPs running on a single CPC. Internal Coupling channels should be used for these connections. Internal Coupling channels can be used only to connect a coupling facility and LPs on the same CPC.
- Can be redundantly configured (two or more coupling facility channels from each CPC involved in coupling facility data sharing) to enhance availability and avoid extended recovery time. This does not apply to Internal Coupling channels.
- Require CFR or CBR channel path definition (coupling facility receiver channel capability) at the coupling facility end of a coupling facility channel connection with a CFS or CBS channel path definition (coupling facility sender channel capability) at the ESA end of a coupling facility channel connection. You must use coupling facility sender and receiver channels when connecting to a CPC or CF that does not support coupling facility peer channels (for example, a 9672).
- Require CFP, CBP, or ICP channel path definition, coupling facility peer channel capability, at the coupling facility and ESA ends of a coupling facility channel

connection. Using coupling facility peer channels is the recommended way to connect to a CPC or CF that does support peer channels (for example, a 2084). CFP, CBP, and ICP channel paths can be shared by many ESA LPs and only one coupling facility LP at the same time.

- Require the following:
  - The CFS channel path must be connected to a CFR channel path.
  - The CBS channel path must be connected to a CBR channel path.
  - The CFP channel path must be connected to another CFP channel path.
  - The CBP channel path must be connected to another CBP channel path. ICB-3 and ICB-4 links are both defined as CBP channel paths. However, it is further required that an ICB-3 link must be connected to another ICB-3 link and that an ICB-4 link must be connected to another ICB-4 link.
  - The ICP channel path must be connected to another ICP channel path. You connect an ICP channel path to another ICP channel path by specifying the CPATH keyword in the CHPID statement for every ICP channel path.
- Require a control unit definition and devices to communicate with the coupling facility end of a coupling facility channel connection. Coupling facility peer channels connecting to only ESA ends of a connection do not require a control unit nor devices. Each coupling facility sender channel requires two devices. Each coupling facility peer channel defined to a control unit (and therefore connected to a CF end of a connection) requires seven devices.

You can configure coupling facility channels as follows:

Coupling Facility Sender Channels (TYPE=CFS or TYPE=CBS)

You can configure a CFS and CBS channel path as:

- An unshared dedicated channel path to a single LP.
- An unshared reconfigurable channel path that can be configured to only one CF LP at a time but that can be dynamically moved to another CF LP in the same CSS by channel path reconfiguration commands
- A shared channel path that can be concurrently used by the LPs in the same CSS to which it is configured.
- A spanned channel path that can be concurrently used by LPs in more than one CSS. Some CPCs do not support spanned CFS and CBS channel paths. See “Keyword Applicability” on page F-7.

  CFS and CBS channel paths are used when connecting to a coupling facility that does not support coupling facility peer channel paths. CFS channel paths are defined for ISC-3 links. CBS channel paths are defined for ICB-2 links. Each CFS and CBS channel path should have 2 devices defined.

Coupling Facility Receiver Channels (TYPE=CFR or TYPE=CBR)

You can configure a CFR and CBR channel path as:

- An unshared dedicated channel path to a single coupling facility LP.
- An unshared reconfigurable channel path that can be configured to only one coupling facility LP at a time but that can be dynamically moved to another coupling facility LP in the same CSS by channel path reconfiguration commands.

CFR and CBR channel paths are used when connecting to a CPC that does not support coupling facility peer channel paths. CFR channel paths are defined for ISC-3 links. CBR channel paths are defined for ICB-2 links.

Coupling Facility Peer Channels (TYPE=CFP, TYPE=CBP, or TYPE=ICP)

You can configure a CFP, CBP, and ICP channel path as:

- An unshared dedicated channel path to a single LP
- An unshared reconfigurable channel path that can be configured to only one LP at a time but that can be dynamically moved to another LP in the same CSS by channel path reconfiguration commands
- A shared channel path that can be concurrently used by the LPs in the same CSS to which it is configured.
- A spanned channel path that can be concurrently used by LPs in more than one CSS. Some CPCs do not support spanned CFP, CBP, and ICP channel paths. See "Keyword Applicability" on page F-7.

Coupling facility peer channel paths can be shared by many ESA LPs and only one coupling facility LP at the same time. CFP and CBP channel paths are used when connecting two CPCs that support coupling facility peer channel paths. ICP channel paths are used when connecting coupling facility and ESA LPs on the same CPC. CFP channel paths are defined for ISC-3 links. CBP channel paths are defined for ICB-3 and ICB-4 links. Each CFP, CBP, and ICP channel path assigned to a coupling facility control unit should have 7 devices defined.

Server Time Protocol: The Server Time Protocol (STP) provides time synchronization among CPCs. STP uses coupling facility peer channels and provides a timing network between CPCs. STP can replace or augment the Sysplex Timer®. If your timing network is for a coupling sysplex, no special I/O definition is required. STP will operate over the existing coupling facility peer channel paths. However, if two systems require a timing link but would not otherwise require coupling facility peer channel paths, a special I/O definition is required. This definition consists of two coupling facility peer channels connected together (one for each CPC), each with a control unit definition with UNIT=STP specified and with no devices.

Defining Internal Coupling Channels (TYPE=ICP)

Internal Coupling (IC) channels are virtual attachments and, as such, require no real hardware. However, they do require CHPID numbers and they do need to be defined in the IOCDS.

It is suggested that you define a minimum of Internal Coupling channels. For most customers, IBM suggests defining just one pair of ICP channel paths for every two coupling facility logical partitions (LPs) in your configuration. For instance, if your general purpose configuration has several ESA LPs and one CF LP, you would define one pair of connected ICP CHPIDs shared by all the LPs in your configuration. If your configuration has several ESA LPs and two CF LPs, you still would only define one connected pair of ICP CHPIDs, but define one ICP CHPID as shared by the ESA LPs and one CF LP and define the other ICP CHPID as shared by the ESA LPs and the other CF LP. Both of these examples best exploit the peer capabilities of these coupling channels by using the "sending" and "receiving" buffers of both channels.

You must define an even number of ICP channel paths, and you must connect them in pairs. Use the CPATH keyword in the CHPID statement to connect ICP CHPIDs. For more information on defining Internal Coupling channels, see the *Processor Resource/Systems Manager Planning Guide* for your system.

Open Systems Adapter (OSA) Feature Support

The OSA features provide connectivity options that allow direct attachment of Fast Ethernet, Gigabit Ethernet, 1000Base-T Ethernet, and Token Ring local area networks (LANs) to the central processor complex (CPC).

The OSA features, when defined as other than OSA-ICC and OSA for NCP, support the CPC acting as an enterprise-wide server for multiple networks. LANs, LAN backbones, high speed workstations, hubs, bridges, and routers that conform to these LAN interface standards can connect directly to the open systems adapter, benefiting from the performance, connectivity, security, availability, and growth opportunities associated with the z/Architecture™.

The OSA-Express and OSA-Express2 1000Base-T Ethernet features, when defined as an OSA-Express Integrated Console Controller (OSA-ICC), provide 3270 sessions that can serve as the system operator or master console for an operating system so you can IPL. OSA-ICC replaces the 2074 Console Support Controller and local, non-SNA 3174 control units. It uses TCP/IP over an Ethernet LAN to attach to personal computers which are running TN3270E emulators.

The OSA-Express2 Gigabit Ethernet and 1000Base-T Ethernet features, when defined as an OSA for network control program (NCP) channel support traffic between an operating system image and a Communication Controller for Linux® (CCL) image. An OSA for NCP channel (TYPE=OSN) and CCL replace the 374x control unit. An operating system image (for example, z/OS) communicates with the OSN channel using the same Channel Data Link Control (CDLC) protocol it used when communicating with the 374x control unit (for example, using an ESCON channel). The NCP function of the 374x control unit is performed by CCL, which communicates with the OSN channel using the QDIO architecture. CCL also has access to LANs through another OSA channel. This enables the operating system image to communicate with the LANs connected to the CCL image. The operating system image communicates with the OSN channel using devices defined in IOCP as 3745 (UNIT keyword on IODEVICE statement). CCL communicates with the OSN channel using devices defined in IOCP as OSN.

OSA Support Facility

The OSA Support Facility for OS/390, z/OS, z/OS.e, z/VM, VSE/ESA, and z/VSE are applications that provide configuration and operations management capabilities for the open systems adapters in the configuration and allows you to install appropriate function onto open systems adapters to support client server applications integrated at the CPC. The OSA Support Facility is not used for OSA-ICC. For OSA for NCP channels, the OSA Support Facility does not provide any configuration management capabilities but provides capabilities only for operations management.

OSA Channels

The OSA channel allows direct connection of LANs using the Queued Direct I/O (QDIO) architecture, the connection of LANs using non-QDIO architectures, the attachment of TN3270E emulators for channels running the non-SNA DFT protocol (OSA-ICC), and communication between operating system images and a CCL image (OSA for NCP). All OSA features provide two LAN ports except for OSA-Express2 10 Gigabit Ethernet, which has one LAN port. Each port is defined in IOCP as a single channel path.

Documents

The following documents provide additional information:

- *Open Systems Adapter-Express Customer's Guide and Reference*, SA22-7935.
- *Open Systems Adapter-Express Integrated Console Controller User's Guide*, SA22-7990.

OSA-ICC Channels (TYPE=OSC)

The following OSA-Express and OSA-Express2 features support OSA-ICC:

- 1000Base-T Ethernet.

OSA QDIO Channels (TYPE=OSD)

The following OSA features support QDIO:

- OSA-Express
  - Gigabit Ethernet
  - 1000Base-T Ethernet
  - Fast Ethernet
  - Token Ring
- OSA-Express2
  - 10 Gigabit Ethernet
  - Gigabit Ethernet
  - 1000Base-T Ethernet.

OSA Non-QDIO Channels (TYPE=OSE)

The following OSA features support Non-QDIO:

- OSA-Express
  - 1000Base-T Ethernet
  - Fast Ethernet
  - Token Ring
- OSA-Express2
  - 1000Base-T Ethernet.

OSA for NCP Channels (TYPE=OSN)

The following OSA-Express2 features support NCP emulation:

- Gigabit Ethernet
- 1000Base-T Ethernet.

OSA Channels for QDIO (TYPE=OSD), Non-QDIO (TYPE=OSE), OSA-ICC (TYPE=OSC), and NCP (TYPE=OSN)

You can configure an OSC, OSD, OSE, or OSN channel path as:

- An unshared dedicated channel path to a single logical partition (LP)
- An unshared reconfigurable channel path that can be configured to only one LP at a time but that can be dynamically moved to another LP in the same CSS using channel path reconfiguration commands
- A shared channel path that can be concurrently used by the LPs in the same CSS to which it is configured
- A spanned channel path that can be concurrently used by LPs in more than one CSS. Some CPCs do not support spanned OSC, OSD, and OSE channel paths. See "Keyword Applicability" on page F-7.

OSA Configuration Considerations

IOCP supports the definition of open systems adapter (OSA) channels. OSA channels use either the Queued Direct I/O (QDIO) architecture or non-QDIO architectures or operate as an OSA-ICC or OSA for NCP based on how they are defined in IOCP. The following table summarizes the connectivity the various channels provide and the channel path type to use to define the channel types to the I/O subsystem.

Table 1-3. Summary of Connectivity

Channel Type	Channel Path Type	Connectivity the Channel Type Provides
OSA QDIO	OSD	All LAN protocols supported by the OSA features that use QDIO architecture
OSA non-QDIO	OSE	All LAN protocols supported by the OSA features that use non-QDIO architectures
OSA-ICC	OSC	TN3270E emulators
OSA for NCP	OSN	CDLC protocol from an operating system image and QDIO architecture from a CCL image. An OSA channel in the CCL image provides LAN connectivity.

Like ESCON and FICON channel paths, you define a control unit and devices for an OSC, OSD, OSE, or OSN channel path even though no control unit or devices exist outside of the IOCDS definitions. These device number and unit address definitions are associated with a channel path. For OSD and OSE channel paths, device numbers are used by software applications (for example, VTAM®) to communicate with networks through an OSD or OSE channel path. For OSC channel paths, device numbers are necessary to configure a TN3270E emulator session. For OSN channel paths, device numbers are necessary for an operating system image to communicate with a CCL image, and they allow the operating system image to communicate with a LAN connected to the CCL image.

For further information on OSD, OSE and OSN configuration requirements for client server applications, see *Open Systems Adapter-Express Customer's Guide and Reference*, SA22-7935. For further information on OSC configuration requirements, see *Open Systems Adapter-Express Integrated Console Controller User's Guide*, SA22-7990.

Devices assigned to OSA channel paths are associated with a LAN port and each application using the OSA channel card. A maximum number of OSA valid subchannels can be defined on OSD and OSN channels or used on OSE channels. An OSA valid subchannel is an OSD, OSE, or OSN device with a unit address in the range 00-FD. The OSAD device with unit address FE (OSD, OSE, or OSN only), used by the OSA Support Facility, is excluded from the maximum. Likewise, a maximum number of valid subchannels can be used on OSC channels. A valid subchannel for an OSC device can have any unit address in the range 00-FC.

Valid subchannels are devices that are defined to a logical partition and permitted for use by the logical partition. Valid subchannels are calculated as follows:

- For unshared channel paths, each device defined in IOCP represents a single valid subchannel.
- For shared channel paths, each device defined in IOCP represents multiple valid subchannels based on the total number of logical partitions (LPs) in its device candidate list.

For example, with a maximum of 480 valid subchannels for an OSD channel path with priority specification enabled, if your configuration has 10 LPs and an OSD channel path is shared by all 10 LPs, each device assigned to the shared OSD channel path has a device candidate list that defaults to all 10 LPs. This allows you to define a maximum of 48 devices per LP for a total of 480 valid subchannels on the channel path. However, if you specify device candidate lists of 5 LPs for each device on the channel path, this allows you to define a maximum of 96 devices per LP for a total of 480 valid subchannels.

TCP/IP assigns each OSA device on an OSD channel path four outbound queues, each of which has a unique priority. These priorities allow the prioritization of outbound work based on TCP/IP Type of Service (TOS) settings. If you choose not to exploit the priorities for a channel, the channel can support four times as many devices where each device has a single outbound queue with a single priority. Specify the CHPARM keyword for the OSD channel path with bit 6 of the CHPARM value on (for example, X'02') to disable priority specification and support a maximum of 1920 OSA valid subchannels (640 TCP/IP stacks). Otherwise, an OSD channel path has priority specification enabled and supports a maximum of 480 OSA valid subchannels (160 TCP/IP stacks). Disabling priority specification is transparent to host policies and applications that set or affect the setting of the TOS byte. For additional information about QDIO priority queuing and how it relates to TOS and quality of service for TCP/IP networks, see *z/OS Communications Server IP Configuration Guide*, SC31-8775.

Attention: Disabling priority specification (for example, specifying CHPARM=02) is supported only for OSA-Express2 features. If it is disabled for an OSA-Express feature, the I/O subsystem flags the channel path with a definition error and the channel path is unavailable until a dynamic I/O change is made or power-on reset is performed with a new IOCDS to resolve the error.

Use of the OSA feature has the following considerations:

- **For all OSA Configurations:**
  - An OSA channel path is associated with a single port on an OSA channel card.
  - For each OSA device on an OSD or OSE channel path, specify UNIT=OSA on the IODEVICE statement.
  - Unit address FF is not allowed.
  - The OSA feature using QDIO architecture uses the I/O device definitions and unit addresses in your IOCDS.
  - A maximum of 480 OSA valid subchannels (160 TCP/IP stacks) can be defined on an OSD channel path when priority specification is enabled (for example, CHPARM=00).
  - A maximum of 1920 OSA valid subchannels (640 TCP/IP stacks) can be defined on an OSD channel path on an OSA-Express2 feature when priority specification is disabled (for example, CHPARM=02).
- **For OSA Configurations Using the OSA Support Facility:**
  - Define a device with unit address FE for every OSD, OSE, or OSN channel path managed by the OSA Support Facility and specify UNIT=OSAD on the IODEVICE statement. For an OSD channel path, the control unit assigned to this device must either have a CUADD keyword value of zero or not specify the CUADD keyword. Otherwise, the device is unusable.

  - A maximum of 240 OSA valid subchannels can be used on an OSE channel path even though IOCP allows you to define more than this. The OSA Support Facility manages this maximum.
- **For OSE Configurations Not Using the OSA Support Facility:**
  - An OSA channel card port configured as an OSE channel path has unit addresses 00-01 associated with it when not using the OSA Support Facility.
  - Only a single logical partition (LP) can use the OSE channel path. To ensure that the channel path can only be used by a single LP, do one of the following:
    - Define the channel path as dedicated or reconfigurable.
    - Define the channel path as shared but give it access to only one LP or define both OSA devices with the same, single LP in their device candidate lists.
    - Define the channel path as shared and devices without device candidate lists but either configure or activate host TCP/IP profiles for the OSA devices in only a single LP. At any time, only a single LP can have a host TCP/IP profile active for the OSA devices.
- **For OSC Configurations:**
  - A maximum of 120 valid subchannels can be used on an OSC channel path even though IOCP allows you to define more than this. The Support Element manages this maximum.
  - Unit address FE is not allowed.
  - The OSC channel must be installed and defined as OSC and must be configured on the Support Element using the Advanced Facilities panel before TN3270E emulator sessions can be used. Under Advanced Facilities, select either Panel Configuration Options or Manual Configuration Options to configure each session you want to use.
- **For OSN Configurations:**
  - For each OSA device on an OSN channel, you must specify UNIT=OSN or UNIT=3745 on the IODEVICE statement.
  - A maximum of 480 OSN valid subchannels and 180 3745 valid subchannels can be defined on an OSN channel path.
  - To reduce the number of valid subchannels, use the device candidate list to restrict the OSN devices to CCL images and the 3745 devices to operating system images.

Internal Queued Direct Communication (HiperSockets) Support

HiperSockets provide a high speed internal TCP/IP connection between applications running on a CPC. These applications (for example, z/OS Communication Server or Linux for zSeries) may be in different z/VM images or different logical partitions. These “connections” are defined to the configuration with Internal Queued Direct (IQD) communication channel path types.

A CPC can support 4096 separate data queues. Typically each queue is represented by one data device and two control devices. IOCP ensures no more than 12288 (3*4096) valid subchannels are defined for all the IQD channel paths in the configuration. Valid subchannels are devices that are defined to a logical partition and permitted for use by the logical partition. Valid subchannels are calculated as follows:

- For unshared channel paths, each IQD device defined in IOCP represents a single valid subchannel.

- For shared channel paths, each IQD device defined in IOCP represents multiple valid subchannels based on the total number of logical partitions (LPs) in its device candidate list.

A CPC allows up to 16 IQD channel paths. However, the only reason to define more than one is to ensure separation of applications. If you require all applications in the CPC to communicate with each other then only one IQD channel path is needed. If your require LPs in different CSSs to communicate, then the IQD channel path must be spanned. If you require one set of logical partitions (LPs) to communicate with each other but not communicate with another set of LPs, then two channel paths need to be defined with each LP set defined in one of the CHPID candidate lists.

You can define up to 12288 valid subchannels or devices on a single IQD channel path. Use as many control unit (CNTLUNIT) definitions as needed to define the necessary number of devices.

You can define up to 256 devices per control unit. Each CNTLUNIT statement for the IQD channel path must contain a unique CUADD value. A maximum of 64 control units may be defined per IQD channel path.

The TCP/IP maximum transmission unit (MTU) and maximum frame size for internal queued direct communication is specified using the CHPARM keyword on the CHPID statement. The following CHPARM keyword values are supported:

- 00 for 8K MTU and 16K frame size
- 40 for 16K MTU and 24K frame size
- 80 for 32K MTU and 40K frame size
- C0 for 56K MTU and 64K frame size.

Additional information on Internal Queued Direct Communication is in the *z/OS Communications Server IP Configuration Guide*, SC31-8775.

Defining IQD Channels

Internal queued direct (IQD) communication channels are virtual attachments and require no real hardware. However, they do require CHPID numbers, and they do need to be defined in the IOCDS.

Define the minimum number of channel paths needed for separation of communicating LPs. Each IQD channel path represents one internal LAN. If you have no requirement to separate LAN traffic between your applications, only one IQD channel path needs to be defined in the configuration.

Fibre Channel Protocol Support

Fibre channel protocol (FCP) channels provide a fibre channel attachment based on the industry-standard Fibre Channel Protocol for SCSI (FCP) standard. FCP is provided by defining a FICON channel as TYPE=FCP on the CHPID statement. FCP supports the attachment of industry-standard storage controllers and devices. Controllers and devices with an FCP interface can be directly attached to the CPC or attached using fibre channel switches. Fibre channel arbitrated loops, based on the FC-AL protocol, can be attached using ports on fibre channel switches, provided the switch supports the protocol. Controllers and devices with a parallel SCSI interface can be attached using fibre-channel-to-SCSI bridges.

FCP channels use the Queued Direct I/O (QDIO) architecture. The QDIO architecture defines control and data devices. Unlike QDIO support in OSA and HiperSockets, FCP does not require control devices. A data device has to be defined in order to manage a QDIO queue pair. A QDIO queue pair consists of a request queue and a response queue. Each QDIO pair is used as a communication path between an Operating System (OS) and the FCP channel. It allows an OS to send FCP requests to the FCP channel and the FCP channel to send responses and pass unsolicited status.

IOCP does not define the actual fibre channel switches, controllers, or devices attached to the channel. Instead, IOCP defines the data devices needed to manage the QDIO queue pairs. Data devices are defined using IODEVICE statements in IOCP. The actual fibre channel devices or logical units (LUNs) to be accessed are configured in your software. This is not done with IOCP. The device numbers defined by IOCP are associated with LUNs on the fibre channel using configuration data specified in the OS.

The FCP channel can support 480 QDIO queue pairs. The data device associated with a QDIO queue pair is used mainly to establish and activate the queue pair or perform queue-level recovery. IOCP prevents the definition of more than 480 valid subchannels on an FCP channel path. Valid subchannels are devices that are defined to a logical partition and for use by the logical partition. Valid subchannels are calculated as follows:

- For unshared channel paths, each FCP device defined in IOCP represents a single valid subchannel.
- For shared channel paths, each FCP device defined in IOCP represents multiple valid subchannels based on the total number of logical partitions (LPs) in its device candidate list.

The unit addresses 'FE' and 'FF' are reserved in an FCP channel. Therefore, IOCP does not allow a device definition with these unit addresses.

Unit addresses 'FC' and 'FD' have special privileges. They should be defined only to operating systems running the Configuration Utility for FCP LUN Access Control.

Without N_Port ID Virtualization (NPIV) or FCP LUN Access Control, there is no access protection between operating system images sharing an FCP channel. Therefore, each OS with access to a shared FCP channel has access to every device (that is, LUN) connected to the channel. Access to a LUN is granted to any of these operating systems on a first-come-first-served basis, and only one OS can use the LUN at a time. If another OS needs to access the LUN, it must be freed (that is, logged out) by the original user.

Refer to http://www.ibm.com/servers/eserver/zseries/connectivity for more information on FCP channels.

N_Port ID Virtualization (NPIV)

On System z9 109 CPCs, NPIV for FCP channels allows multiple operating systems to share a single LUN. The industry standard NPIV is preferred over FCP LUN Access Control. The FCP channel must be directly attached to a fibre channel switch that supports NPIV. Each operating system is assigned a unique fibre channel N_Port identifier when it performs a login to the switch. Therefore, the I/O transactions to a LUN for each operating system are separately identified, managed, and transmitted, and are processed the same as if each operating system had its own unique FCP channel.

FCP LUN Access Control

The Configuration Utility for FCP LUN Access Control can communicate with the channel through subchannels defined with unit addresses 'FC' and 'FD' only. Therefore, only operating systems having defined a unit address of 'FC' or 'FD' on an FCP channel can set or modify access rights for the channel.

With FCP LUN Access Control, you define individual access rights to LUNs for each OS image through an access control table. The access control table can be used to define the following:

- Which OS image has exclusive read/write access to a LUN
- Which OS images have shared read-only access to a LUN. No OS can write to a LUN defined with shared read-only access.

The Configuration Utility for FCP LUN Access Control processes the access control table and writes the defined access control functions in the FCP channel. The access control table is activated by issuing an **actcli** command from the Linux image containing the Configuration Utility for FCP LUN Access Control. See *Configuration Utility for FCP LUN Access Control User's Guide*, SC33-8280, for more information.

Defining FICON Switch Configurations

A fibre channel switch topology is called a "fabric." A FICON fibre channel fabric can consist of one or more switches. A FICON cascaded-switch fabric is a topology that consists of more than one switch between a channel and its control unit.

When a FICON (TYPE=FC) channel connects to a switch, the SWITCH keyword must be specified on the CHPID statement. The value specified is the switch number of the entry switch. The entry switch is the switch to which the FICON channel actually connects. The switch number is an arbitrary value and is not the same as the switch address. The switch number is required to be:

- In the range of '00' - 'FF'
- Unique from all other FICON switch numbers across the configuration
- Unique from any ESCON switch numbers specified for channel path types CVC, CBY, CNC, CTC, and FCV.

Fibre channel port addressing identifies a destination port in a fibre channel fabric. Fibre channel port addressing is always done with 3 bytes containing 6 hexadecimal digits, *ddaapp*. The first byte, *dd*, is the switch domain ID or switch address. The switch address is set for a FICON switch by using switch control panels. The second byte, *aa*, is the port area address or port address of the port on the switch. This port (with its port address) is where a control unit or channel is connected and is known as an F-Port. The third byte, *pp*, is an address on a fibre channel arbitrated loop. FICON does not support arbitrated loops and for all FICON F-Ports in the fabric, the *pp* portion of the address must be a constant value. The *pp* value is never specified in IOCP.

To support cascaded switches, the fabric must be what is generally called a *high integrity fabric*. A high integrity fabric ensures data integrity by detecting any miscabling within a FICON cascaded switch fabric that could lead to I/O data being delivered to the wrong destination. A high integrity fabric is one that both supports and is configured to exploit *fabric-binding* and *insistent domain IDs*. Fabric-binding is the ability of the fabric to prevent another switch from being added operationally to the fabric without the new switch being properly planned for in the fabric and the

switch being configured with the high integrity attributes. An insistent domain ID is a function of the fabric that does not allow the switch address to be automatically changed when a duplicate switch address is added to the fabric. Instead, fabrics using insistent domain IDs require an operator's overt action to change a switch address. The customization of fabric-binding and the setting of an insistent domain ID are normally done only at switch installation time or reinstallation time.

Note: Not all FICON switches support high integrity fabrics. Such switches can only be used in a single-switch FICON fabric.

LINK address values for FICON control units are specified as 1 or 2 bytes as follows:

- When a channel path is connected to a cascaded-switch fabric and has a control unit not connected to the same switch as the channel (that is, not the entry switch), 2-byte LINK address values must be specified for the channel path in all of its control unit definitions. You do not need to change other LINK address values in the control units. Control units can contain a mixture of 1-byte and 2-byte link addresses.
- When all the control units for a channel path connect to the entry switch, the LINK address values for the channel path in its control unit definitions can either be 1- or 2-byte addresses. Two-byte addresses are supported only if the switch is configured with the high-integrity attributes.

If 2-byte link addresses are specified for a channel and it is not connected to a high-integrity fabric, the channel fails to initialize and is unusable until one of the following occurs:

- The definitions are changed to 1-byte link addresses
- The fabric is configured to support the high-integrity attributes
- The channel connection is changed to a fabric that does support high-integrity.

A 2-byte LINK address value has a first byte with the switch address, *dd*, and a second byte with the port address, *aa*. A one-byte LINK address value consists of only the port address, *aa*.

Rules for defining a cascaded FICON switch configuration follow:

- When a control unit is not connected to the entry switch for its channel path, the link address for that path must be specified as a 2-byte address in the LINK keyword. Note that other paths to the control unit can use 1- or 2-byte link addresses as appropriate.
- After a 2-byte address is specified for a channel path, all the link address values for that channel path must also be specified as 2 bytes. This is true even if a control unit is attached to the entry switch for the channel path.

The following are recommendations, but not requirements, when configuring switches for FICON:

- Even in a single switch configuration, after your switch fully supports and is customized for high-integrity attributes, 2-byte link addresses should be specified for control units on that switch. This allows an easy transition to a cascaded environment.

  Note: Before converting to 2-byte link addresses, ensure your applications and operating system have any needed updates to support cascading.

- When configuring your switches and assigning switch addresses to them, use unique switch addresses across all the fabrics in your entire enterprise and not only the switches within a single fabric.

  Note: A switch may support only certain switch addresses or domain IDs instead of the full range of '00'-'FF'. For details, check the configuration information your switch vendor provides.
- When choosing the switch number (SWITCH keyword value) for your entry switch, try to use the same value as the switch address of the switch to which the channel connects. This reduces the number of ways the same switch is known.
- After a 2-byte link address has been specified for a channel path, try to specify 2-byte link addresses for all paths (from the same CPC) that have the same entry switch (SWITCH keyword). This can allow IOCP to perform better checking of the switch configuration.

Managing Logical Paths for ESCON and FICON Channels

A *logical path* is a logical connection between a control unit and an ESCON channel (TYPE=CNC or CTC), a FICON channel (TYPE=FC), or a FICON channel attached to an ESCON Director (TYPE=FCV). Logical paths are important because, for I/O operations to occur, a CPC requires that a logical path be established between an ESCON or FICON channel and a control unit

Logical paths do not exist for ESCON channels attached to a 9034 ESCON Converter Model 1 (TYPE=CBY or CVC). These channels connect to a parallel channel port on a control unit. However, some control units that support both parallel and ESCON channels reserve a logical path for each attached parallel channel port.

Logical paths do not exist for coupling facility channel paths (TYPE=CFS, CFR, CFP, CBS, CBR, CBP, or ICP) or OSA channels (TYPE=OSC, OSD, OSE, or OSN), fiber channel protocol channels (TYPE=FCP), or internal queued direct communication channels (TYPE=IQD).

Control Unit Allocation of Logical Paths

Control units allocate logical paths to channels dynamically on a first-come-first-served basis. Control units do not manage the allocation of logical paths but instead allow channels to compete for logical paths until all of the control unit's logical paths are used.

Why Manage Logical Paths

The ESCON and FICON environments (the use of ESCON and FICON channels and ESCON and FICON Directors) greatly enhances the connectivity potential for control units. In addition, you can define shared channels that can request additional logical paths. However, control units can only allocate a limited number of logical paths (see Table 1-4 on page 1-33) in relation to the number of logical paths that channels can request. In configurations where channels request more logical paths than a control unit can allocate, you must manage logical paths to ensure that the I/O operations you intend take place.

Table 1-4. Logical Path Summary by Control Unit

Control Unit	Maximum Physical Links	Logical Paths per Link	Maximum Logical Paths
2105 Storage Control			
2105	32	64	2048
3990 Storage Control			
3990-2	16	Note 1	16
3990-3	16	Note 1	16
3990-6	16	Note 2	128
9343 Storage Controller			
9343 D04	4	64	64
9343 DC4	4	64	64
3590 Magnetic Tape Subsystem			
3590	2	64	128
3490 Magnetic Tape Subsystem			
3490 D31, D32, D33, D34	1	16	16
3490 C10, C11, C12	1	16	16
3490 A01	2	16	32
3490 A10	4	16	64
3490 A02	4	16	64
3490 A20	8	16	128
3172 Interconnect Controller			
3172-1	2	Note 3	16
3174 Establishment Controller			
3174 12L (SNA only)	1	Note 3	8
3174 22L (SNA only)	1	Note 3	8

Notes:

1. 3990-2 and 3990-3 Storage Controls can have eight logical paths per side, two sides, with a minimum of one logical path per adapter.
2. The 3990-6 Storage Control can have 64 logical paths per side, two sides, with a maximum of 32 logical paths per adapter.
3. The 3172 Interconnect Controller and the 3174 Establishment Controller can have one logical path per logical control unit (LCU) with a maximum of eight LCUs per link.

Managing the Establishment of Logical Paths

You can manage the establishment of logical paths between channels and control units. With proper planning, you can create I/O configuration definitions that allow control units in the configuration to allocate logical paths for every possible request made by channels in either of the following ways:

- Create a one-to-one correspondence between the logical path capacity of all control units in the physical configuration and the channels attempting to request them.

- Create I/O configurations that can exceed the logical path capacity of all or some of the control units in the physical configuration but, at the same time, provide the capability to selectively establish logical connectivity between control units and channels as needed.

Logical Path Considerations

You can better understand how to manage the establishment of logical paths by understanding the following:

- Control unit considerations
- Connectivity considerations
- Channel configuration considerations
- 9035 ESCON Converter considerations

Control Unit Considerations

Consider the following factors concerning the allocation of logical paths by control units:

- Control units allocate logical paths dynamically on a first-come-first-served basis.
- Control units do not manage the allocation of logical paths but instead allow channels to compete for logical paths until all of the control unit's logical paths are used.
- Control units vary in the number of logical paths they support. See Table 1-4 on page 1-33.
- Some control units that support a mix of parallel and ESCON ports can reduce the number of logical paths allocated to ESCON channels because they reserve a logical path for each parallel port.

Connectivity Considerations

ESCON and FICON system hardware, CPCs, and ESCON and FICON Directors, can significantly affect the volume of logical path requests to a control unit as follows:

- Control units can attach to one or more ports on a director or to additional ports on other directors. Each director port can dynamically connect to many other ports to which channels requesting logical paths are attached.
- Each logical partition with channels attaching to the same control unit will compete for the same control unit's logical paths.
- In a configuration where control units are shared by different CPCs, I/O configuration definitions for individual control units are not coordinated automatically among the IOCDSs of the different CPCs. Each CPC competes for a control unit's logical paths.
- Shared channels require the establishment of a logical path for each active logical partition sharing the channel. This can significantly increase the number of logical paths that a single channel requests.

Channel Configuration Considerations

The following configuration rules determine how logical paths are established for ESCON and FICON channels.

- A channel initially attempts to establish logical paths:
  - For channels configured online to logical partitions that are activated at POR. Shared channels attempt to establish logical paths only for those activated logical partitions with the channel configured online.
  - When a logical partition is activated.
  - When configured online (if previously configured offline).

- A channel that cannot initially establish a logical path can reattempt to establish a logical path if the channel detects or is notified of:
  - A change in the state of a control unit
  - A change in the state of a link or port
  - A dynamic I/O configuration change that frees previously allocated logical paths.
- A channel cannot establish a logical path or its logical path is removed if:
  - A logical partition is deactivated. A shared channel continues to operate for any other remaining activated logical partitions to which it is defined. Logical paths to those logical partitions remain established.
  - The director that connects the channel to the control unit blocks either the channel port or control unit port used in the path.
  - The director that connects the channel to the control unit prohibits the dynamic connection or communication between the channel port and the control unit port used in the path.
  - A link involved in the path fails or is disconnected. When a shared channel is affected by the blocking of a port, a prohibited dynamic connection or communication, or a failing or disconnected link, each logical partition sharing the channel is equally affected and all logical paths using the port or link are removed (regardless of the logical partition with which they are associated).
  - The channel is configured offline. When a shared channel is configured offline for a logical partition, it continues to operate for any other logical partition that has the channel configured online. Logical paths to these other logical partitions remain established.
  - Power to the channel, control units, or directors in the configuration is turned off.
- A shared channel cannot establish a logical path to a control unit for a logical partition that cannot access any of the I/O devices on the control unit. The PART, PARTITION or NOTPART keyword on the IODEVICE statement specifies which logical partitions are permitted to access a device.
- A channel does not establish a logical path to a control unit if no devices are defined on the control unit.

9035 ESCON Converter Considerations

For the 3990, 9035 configuration requires special Vital Product Data (VPD) specification. When an ESCON Director blocks a port supporting a 9035 or prohibits a dynamic connection between the channel attached to the 9035 and the control unit, the logical path is removed from the 3990. This path is now available to other channels, either to another 9035 configured in the VPD or to channels not attached to a 9035 that attempt to establish a logical path. The 3990 always attempts to establish a logical path to the 9035s configured in the VPD before it allows a channel not attached to a 9035 to have a logical path.

Recommendations for Managing Logical Paths

You do **not** need to manage logical paths to a control unit if the control unit supports the number of logical paths required by the I/O configuration. However, if a control unit does **not** support the number of logical paths required by the I/O configuration, you can manage logical paths as follows:

- Deactivate unneeded logical partitions (LPs).
- Configure offline unneeded channels. For shared channels, configure offline unneeded channels on an LP basis.

- For a control unit attached to shared channels, limit the number of LPs that can access the I/O devices attached to the control unit.

  To limit LP access to I/O devices, specify a device candidate list for each I/O device attached to the control unit. The device candidate list (determined by the PART, PARTITION or NOTPART keyword in the IODEVICE statement) indicates the LPs that can access the I/O device. LPs **not** in the device candidate list **cannot** access the I/O device.

  A shared channel does **not** establish a logical path from an LP to an attached control unit if all the I/O devices attached to the control unit deny access to the LP.
- Use the director to block ports or prohibit dynamic connections or communication between ports.
- Combinations of the preceding.

Channel Path Selection

A logical channel subsystem (CSS) uses a rotation order for the initiation of I/O requests to a device. In addition, you can select a preferred path which causes the CSS to always attempt the initial selection on that path.

Rotation Order

You control the rotation order to a device with the order of the:

- Control unit numbers of the control units that attach to the device
- Channel paths used by the control units

Note: See “CNTLUNIT” on page 2-28 for a description of the CUNUMBR and PATH keywords in the CNTLUNIT statement.

Rotation order does not apply to devices assigned to CFS, CFP, CBS, CBP, or ICP channel paths. The CSS selects the channel path that is likely to have the best response time.

The rotation order for a control unit header is built using the first channel path you specify for each control unit that attaches to a device, beginning with the lowest numbered control unit. The rotation order then is built using the second channel path, if any, for each control unit beginning with the lowest numbered control unit. The rotation order is built by repeating this procedure until all channel paths for all the control units contained in a control unit header have been added.

Control unit header 2 in Figure 1-4 on page 1-16 shows an example of how specifying paths in a control unit header can affect the path rotation order. If you specify PATH=(01,07) in the CNTLUNIT statement for physical control unit 2, and PATH=(02,04) for physical control unit 3, the rotation order for device B is 01, 02, 07, 04. However, if you specify PATH=(07,01) in the CNTLUNIT statement for control unit 2, and PATH=(02,04) for control unit statement 3, the rotation order for device B is 07, 02, 01, 04

Rotating Path Selection

The CSS tries to initiate each new I/O request for an I/O device on a rotating channel path basis within the paths in the control unit header. The CSS tries the next channel path in the rotation order following the last channel path initially selected for an I/O request for the control unit header. If that channel path is busy or unavailable, the CSS chooses the channel path in the control unit header that

has the greatest likelihood of being available. Therefore, the rotation order is only used for the initial attempt for an I/O request.

Path Selection Using a Preferred Path

When you specify a preferred path in the IODEVICE statement, the CSS always tries the preferred path first. If it is busy or unavailable, the CSS chooses the channel path in the control unit header rotation order that has the greatest likelihood of being available.

Channel paths to a device can belong to different logical partitions. I/O requests from any one logical partition use only the paths you assign to that logical partition. The rotation order for a device in a logical partition then follows the normal rotation order for the channel paths that belong to that logical partition.

When you specify a preferred path in an IODEVICE statement that is available to more than one logical partition, the device has a preferred path in all of its logical partitions in that CSS even though you can specify only one channel path per CSS in an IODEVICE statement as a preferred path. The preferred path for each LP is the first path in the rotation order that is defined to the LP beginning with the specified preferred path.

For example, assume that control unit header 2 in Figure 1-4 on page 1-16 has a rotation order of 01, 02, 07, 04 and paths 01 and 02 are in logical partition LP1 and paths 04 and 07 are in logical partition LP2. If device B specifies 02 as its preferred path, then 02 is the preferred path for logical partition LP1 and 07 is the preferred path for logical partition LP2.

Control Unit Types

IOCP defines control units as type 1 or type 2. Type 1 control units allow only a single channel program at any one time. Type 2 control units allow multiple channel programs to run concurrently. IOCP uses the SHARED parameter on the CNTLUNIT statement for control units assigned to only CVC channel paths (TYPE keyword) to determine the control unit type as follows:

- If you specify SHARED=Y, IOCP defines the control unit as type 1. The logical channel subsystem allows only one I/O request at a time.
- If you specify SHARED=N, IOCP assigns the control unit as type 2. The logical channel subsystem allows multiple I/O requests.
- IOCP assigns all control units attached to CBY, CNC, CTC, OSC, OSD, OSE, OSN, FCV, FC, or IQD channel paths as type 2. It ignores the SHARED keyword, if specified.
- IOCP assigns all control units attached to CFS, CFP, CBS, CBP, or ICP channel paths as type 1. It ignores the SHARED keyword, if specified.

Note: Type 1 and type 2 control units as defined here pertain only to the number of channel programs that can run concurrently. This is not directly related to the definitions of type 1, type 2, and type 3 control units as given in *System/360 and System/370 I/O Interface Channel to Control Unit Original Equipment Manufacturers' Information*, GA22-6974. However, all control units that document GA22-6974 designates as type 1 or type 3 should be specified as SHARED=Y. Control units that GA22-6974 designates as type 2 may be able to run one or multiple channel programs concurrently and would, therefore, be considered type 1 or type 2 for purposes of IOCP.

Versions of IOCP

Four versions of IOCP are available; three are batch versions (or operating system versions), and one is a stand-alone version (available on CPC support element). They are as follows:

- **Batch Versions (or Operating System Versions)**
  - z/OS
  - VM
  - VSE
- **Stand-Alone Version**

Batch versions of IOCP have an advantage over the stand-alone version. You can modify an IOCDS while other system operations continue. Then, at a convenient time, shut down your operating systems, perform a power-on reset on the CPC (with the new IOCDS), activate your logical partitions, and reload your operating systems. This method minimizes the amount of time that the system must be inactive while you reconfigure the I/O devices

Overview of the z/OS Version of IOCP

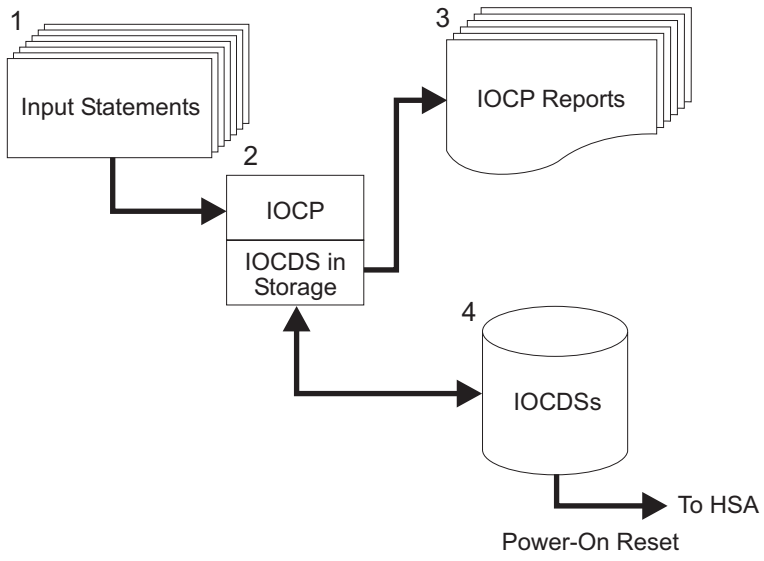
The z/OS version of IOCP runs as a job under control of OS/390, z/OS, or z/OS.e. Run the z/OS version of IOCP by using z/OS JCL statements. By coding options in the PARM parameter of the EXEC statement, you can request the following IOCP functions:

- Generate an IOCDS.

  IOCP reads, validates, and checks the syntax of the input statements. It generates an IOCDS based on the configuration defined in the statements. It produces reports of the IOCDS generated, and, when requested, IOCP writes the generated IOCDS to the support element hard disk.
- Produce configuration reports.

  IOCP reads one or more IOCDSs into storage from the support element hard disk and prints the IOCP configuration reports. (See Chapter 7, “IOCP Configuration Reports” for examples.)

See Chapter 3, “Running the z/OS Version of IOCP” for a full description of the z/OS version of IOCP. Figure 1-6 on page 1-39 shows an overview of the processing the z/OS version of IOCP performs.



1. The card-image input contains IOCP statements.
2. IOCP processes the IOCP statements, generates an IOCDS, produces reports, and (when requested) writes the generated IOCDS to the support element hard disk.
3. The configuration reports allow you to check the I/O configuration as defined in the IOCDSs.
4. The IOCDSs reside on the support element hard disk. At power-on reset, the I/O configuration data is loaded into the hardware system area (HSA). (The I/O subsystem subsequently uses the data to control I/O requests.)

Figure 1-6. Overview of z/OS Version of IOCP

IOCP and z/OS Hardware Configuration Definition

The Hardware Configuration Definition (HCD) defines the I/O configuration information to both the z/OS operating system and the CPC I/O subsystem. HCD also allows you to dynamically modify the I/O configuration without performing:

- Power-on reset of the CPC
- Initial program load of the operating system

Using HCD you can add, delete, or modify the I/O definitions of channel paths, control units, and I/O devices in the CPC. It also allows you to save the changes you made to the I/O configuration definitions and apply them to the power-on reset I/O configuration data set (POR IOCDS). You must use an IOCDS generated from an I/O definition file (IODF) to be able to dynamically modify the I/O configuration. For more information, see *OS/390 Hardware Configuration Definition User's Guide*, SC28-1848, or *z/OS Hardware Configuration Definition User's Guide*, SC33-7988.

IOCDS Write Authorization

If you use HCD, you do **not** need to run IOCP directly to define the I/O configuration to the I/O subsystem. However, HCD does run IOCP when it needs to write an IOCDS, and you must be authorized to write an IOCDS either through the system operator (IOCP message ICP050D prompts the operator) or through a security product (for example, RACF®). To avoid operator intervention and the IOCP message prompt (ICP050D), see "Authorizing an IOCDS Write" on page 3-3.

Overview of the VM Version of IOCP

The VM version of IOCP runs under the control of z/VM. Run the VM version of IOCP in the conversational monitor system (CMS) environment. The CMS IOCP command runs IOCP and has options that allow you to request the following IOCP functions:

- Generate an IOCDS.

  IOCP reads, validates, and checks the syntax of the input statements. It generates an IOCDS based on the configuration defined in the statements. It produces reports of the IOCDS generated, and, when requested, IOCP writes the generated IOCDS to the support element hard disk.
- Produce configuration reports.

  IOCP reads one or more IOCDSs from the support element into storage and prints the IOCP configuration reports. (See Chapter 7, “IOCP Configuration Reports” for examples.)

For a full description of the VM version of IOCP, see Chapter 4, “Running the VM Version of IOCP.”

IOCP and System Generation of a VM Operating System

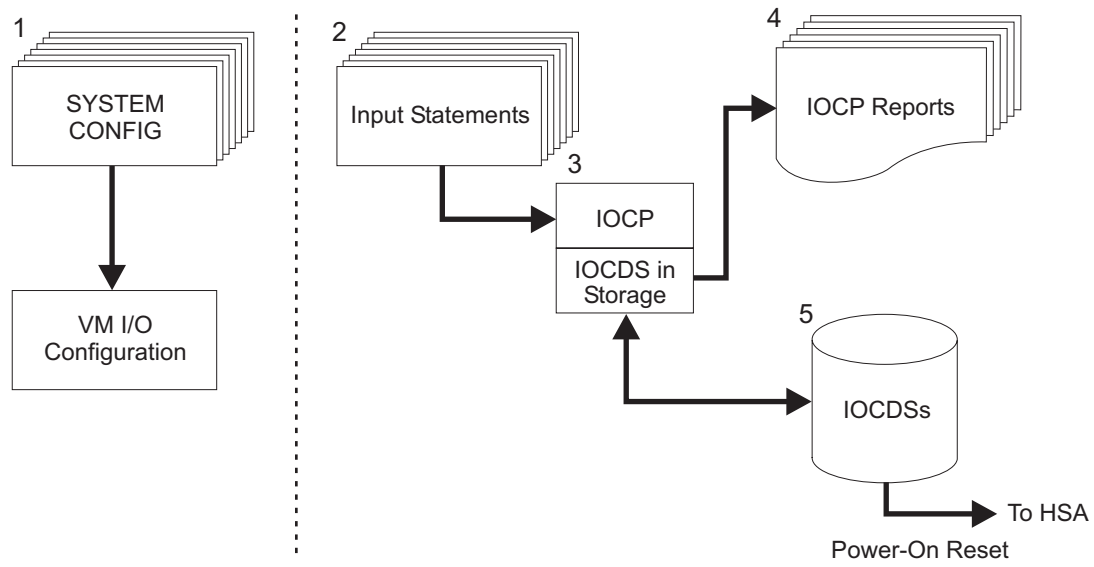
You must define your I/O configuration to the hardware and conditionally to VM. When you perform an initial program load (IPL) of VM, VM creates its software I/O configuration by sensing the devices in the hardware I/O configuration. If all the devices return all of the information VM needs, VM completes its software I/O configuration. If not, you must specify this information in the system configuration file or the real I/O configuration file.

To define the devices in your I/O configuration that VM cannot sense, use a set of I/O statements for your VM operating system. Use the system configuration file (SYSTEM CONFIG) on the parm disk. You can also use the obsolete real I/O configuration file (HCPRIO) in the CP nucleus.

When you perform system generation, the control program uses the statements in the real I/O configuration file to define the I/O configuration to the operating system. When you perform an IPL of VM, VM uses a combination of the real I/O configuration file, the system configuration file, and the devices it senses during IPL to define the I/O configuration to the operating system. VM also updates its software I/O configuration by sensing devices when they are varied online or initialized.

To define your I/O configuration to hardware, you use a set of I/O statements in an IOCP file. When you enter the IOCP command, the IOCP program uses the I/O statements in the IOCP file to define the I/O configuration to the CPC.

For more information about performing these tasks, see Chapter 4, “Running the VM Version of IOCP.” Figure 1-7 on page 1-41 shows an overview of the processing performed by the VM version of IOCP.



1. Use the system configuration file (SYSTEM CONFIG) to define to the system control program those devices in the I/O configuration that VM cannot sense. For VM system generation, you can also use the obsolete real I/O configuration file (HCPRIO).
2. The input file contains the IOCP statements that define the I/O configuration to IOCP.
3. IOCP processes the IOCP statements, generates an IOCDS, produces reports, and, when requested, writes the generated IOCDS to the support element hard disk.
4. The configuration reports allow you to check the I/O configuration as defined in the IOCDSs.
5. The IOCDSs reside on the support element hard disk. At power-on reset, the support element loads the I/O configuration data into the hardware system area (HSA). (The I/O subsystem subsequently uses the data in the hardware system area (HSA) to control I/O requests.)

Figure 1-7. Overview of VM Version of IOCP

IOCP and VM Dynamic I/O Configuration

VM allows you to dynamically modify the I/O configuration without performing:

- Power-on reset (POR) of the CPC
- Initial program load of the operating system.

On z/VM you can use HCD and HCM to add, delete, or modify the I/O definitions of channel paths, control units, and I/O devices in the CPC. It also allows you to save the changes you made to the I/O configuration definition data set (POR IOCDS). You must use an IOCDS generated from an I/O definition file (IODF) to be able to dynamically modify the I/O configuration using HCD. For more information, see *z/VM Dynamic I/O Configuration Planning and Administration*, SC24-6044.

Alternatively, using VM CP commands, you can add, delete, or modify the I/O definitions of channel paths, control units, and I/O devices in the CPC. Using the IOCP utility on CMS (DYN option), you can write a new POR IOCDS containing the same I/O configuration changes. For more information, see the *z/VM Planning and Administration*, GA22-6974, and *z/VM CP Command and Utility Reference*, GA22-6974.

Overview of the VSE Version of IOCP

The VSE version of IOCP runs under control of VSE/Enterprise Systems Architecture (VSE/ESA) or z/VSE. Run the VSE version of IOCP by using VSE JCL statements. By coding options in the PARM parameter of the EXEC statement, you can:

- Generate an IOCDS.

  IOCP reads, validates, and checks the syntax of the input statements. It generates an IOCDS based on the configuration defined in the statements. It produces reports of the IOCDS generated, and, when requested, IOCP writes the generated IOCDS to the support element hard disk.
- Produce configuration reports.

  IOCP reads one or more IOCDSs into storage from the support element and prints the IOCP configuration reports. (See Chapter 7, “IOCP Configuration Reports” for examples.)

Note: If you run VSE as a guest under VM, writing an IOCDS is not supported.

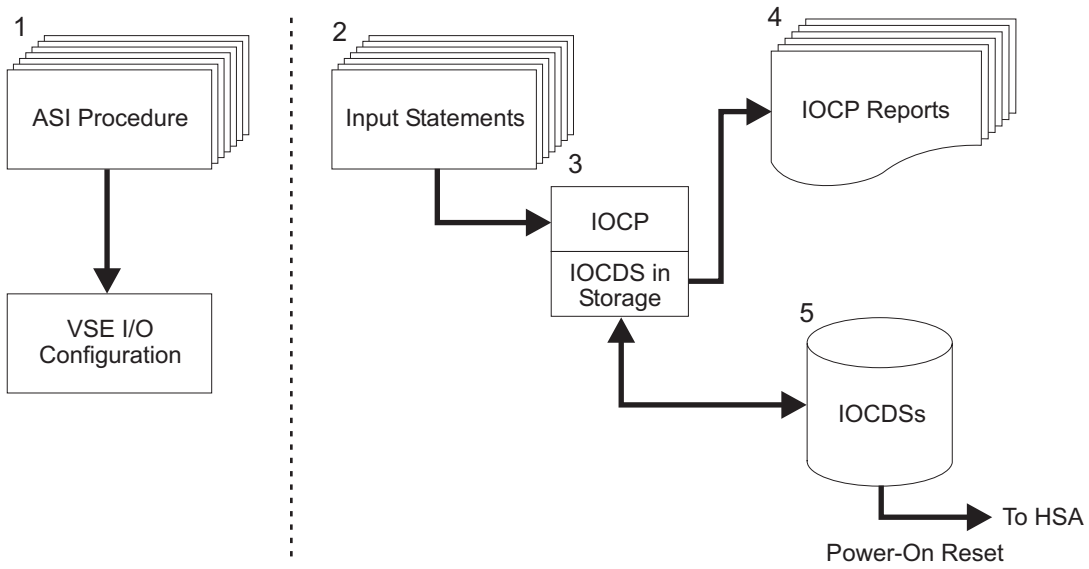
For a full description of the VSE version of IOCP, see Chapter 5, “Running the VSE Version of IOCP.”

IOCP and System Generation of a VSE Operating System

You must define your I/O configuration to both software and hardware. VSE builds the ASI Procedure file, which contains the statements that define the I/O configuration to your VSE operating system.

To define the I/O configuration to hardware, use a set of I/O statements in a separate IOCP file. IOCP uses the I/O statements in the IOCP file to define the I/O configuration to the processor.

Figure 1-8 on page 1-43 shows an overview of the processing performed by the VSE version of IOCP.



1. For VSE system generation, the ASI Procedure file defines the I/O configuration information to the system control program.
2. The input file contains the IOCP statements used to define the I/O configuration to IOCP.
3. IOCP processes the IOCP statements, generates an IOCDS, produces reports, and, when requested, writes the generated IOCDS to the support element hard disk.
4. The configuration reports allow you to check the I/O configuration as defined in the IOCDSs.
5. The IOCDSs reside on the support element hard disk. At power-on reset, the support element loads the I/O configuration data into the hardware system area (HSA). (The I/O subsystem uses the data in the hardware system area (HSA) to control I/O requests.)

Figure 1-8. Overview of VSE Version of IOCP

Overview of the Stand-Alone Version of IOCP

Start and control the stand-alone version of IOCP from the CPC console. The CPC console is a logical console available from the Hardware Management Console through the CPC Console task or from the support element (SE).

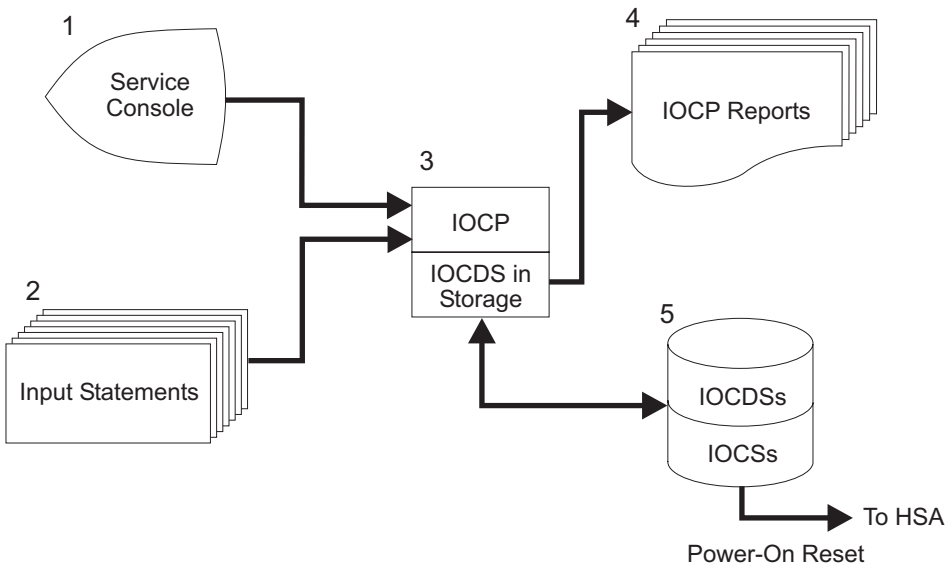
Run the stand-alone version of IOCP to define I/O configuration data when you operate your system before installing z/OS, VM, or VSE, or when you operate your system with a control program other than these.

Start IOCP by selecting the I/O Configuration task from the support element or Hardware Management Console. Briefly, the functions you can request are as follows:

1. Import a card-image statement file from the Hardware Management Console diskette drive or from an FTP location.
2. Export a card-image statement file to the Hardware Management Console diskette drive or to an FTP location.
3. Edit IOCP card-image data. You can supply card-image data by using the disassemble or import functions, or the stand-alone IOCP editor.

4. Build an IOCDS read from the I/O configuration source (IOCS) file on the SE hard disk. IOCP writes the IOCDS to the SE after a successful build.
5. Disassemble an IOCDS from the SE hard disk to create an IOCS file on the SE hard disk.

For a description of the stand-alone version of IOCP, see Chapter 6, “Running the Stand-Alone Version of IOCP.” Figure 1-9 shows an overview of the processing performed by the stand-alone version of IOCP.



1. You control IOCP from the support element or Hardware Management Console.
2. The card-image input contains IOCP statements from the support element (SE) hard disk. You can also load card images into the stand-alone IOCP editor from an I/O configuration source (IOCS) file.
3. IOCP processes IOCP panel commands from the CPC console to control IOCP functions. If desired, you can use the stand-alone editor to inspect, create, or modify card images from an IOCS file using the CPC console. Use the CPC console to:
   - Import and export card image statements files
   - Disassemble an IOCDS
   - Build an IOCDS
   - Print configuration reports
4. Configuration reports allow you to check the I/O configuration data as defined in the IOCDSs.
5. Build a new IOCDS from an IOCS file or disassemble an existing IOCDS to generate an IOCS file. The IOCDSs and IOCSs reside on the support element (SE) hard disk. When you perform power-on reset, the IOCDS is loaded into the hardware system area (HSA). (The I/O subsystem uses the data in the HSA to control I/O requests.)

Figure 1-9. Overview of Stand-Alone Version of IOCP

Chapter 2. IOCP Statements and Functions

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In This Chapter

This chapter describes the following:

- Purpose of IOCP statements
- How to code them:
  - Using z/OS
  - Using VM
  - Using VSE

Using This Chapter

Because this chapter describes IOCP statements as you will use them in z/OS, VM, and VSE operating systems, special care is taken to identify any information that is specific to an operating system. This information is identified as follows:

For z/OS

Information placed in this box is specific to the z/OS operating system.

Specifying IOCP Statements

The rules for coding IOCP card-image statements follow the rules for assembler language. See Appendix A, “Coding IOCP Statements” for a summary of the rules for coding statements and the notation used in this document to illustrate statements.

IOCP has five statements: ID, RESOURCE, CHPID, CNTLUNIT, and IODEVICE. The ID statement is optional; code it if you want specific identification information in the heading of IOCP configuration reports and on support element displays. The RESOURCE statement is required and defines the logical partitions and logical channel subsystems in your configuration. CHPID, CNTLUNIT, and IODEVICE statements are optional and define, respectively, channel paths, control units, and I/O devices in your configuration.

Note: While IOCP requires only the RESOURCE statement, most I/O configurations need CHPID, CNTLUNIT, and IODEVICE statements to be usable.

The following general rules apply to the sequence of IOCP statements in the input file:

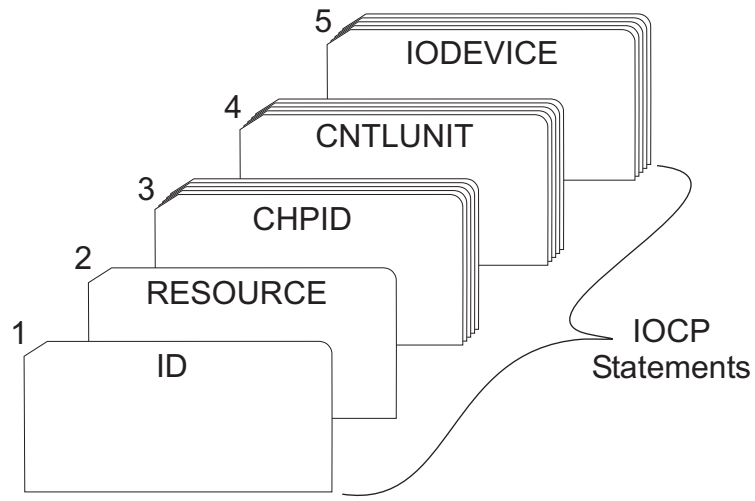
- The ID statement can be coded only once and must precede other IOCP statements.
- The RESOURCE statement can be coded only once and must precede all CHPID statements.
- A CHPID statement that defines a channel path must precede a CNTLUNIT statement that refers to the channel path.
- A CNTLUNIT statement must follow the CHPID statement that defines the channel path to which the control unit is attached.
- An IODEVICE statement must follow the CNTLUNIT statement that defines the control unit to which the device is assigned.
- IOCP comment cards (specified by an asterisk (*) in column 1 or by .* in columns 1 and 2) can be inserted in the input file where desired.

Because of these rules, it is suggested that you group all CHPID statements together, followed by all CNTLUNIT statements, and then all IODEVICE statements. Alternatively, you might group all CHPID statements together, followed by groups of related CNTLUNIT and IODEVICE statements (as shown in Appendix B, “Lists of Statement Input”).

IOCP and z/OS I/O Configuration

The Hardware Configuration Definition (HCD) defines the I/O configuration to the z/OS operating system and the I/O subsystem. You do not need to run IOCP directly to define the I/O configuration to the I/O subsystem. However, HCD does run IOCP when it needs to write an IOCDS.

Figure 2-1 shows a typical input file containing IOCP statements. Appendix B, “Lists of Statement Input,” on page B-1 shows a list of a typical input file containing IOCP statements.



1. **ID** statement (optional) defines heading data for configuration reports. Only one ID statement is allowed.
2. **RESOURCE** statement (required) defines the logical partitions and logical channel subsystems. Only one RESOURCE statement is allowed.
3. **CHPID** statements (optional) define channel paths.
4. **CNTLUNIT** statements (optional) define control units. Each control unit must be defined in a separate CNTLUNIT statement.
5. **IODEVICE** statements (optional) define I/O devices. As many as 256 I/O devices can be defined in an IODEVICE statement.

Figure 2-1. IOCP Statements

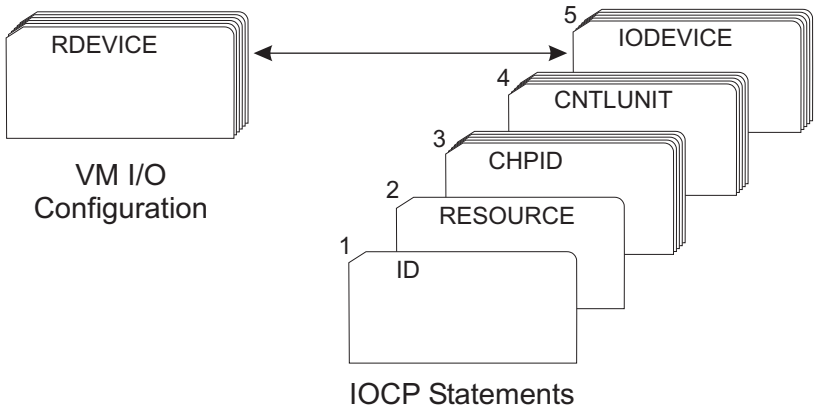
IOCP and VM I/O Configuration

The information in some VM I/O configuration statements must correspond to the information in IOCP statements (see Figure 2-2 on page 2-4). This chapter covers detailed information about the correspondence between VM I/O configuration statements and IOCP statements.

Do not mix IOCP statements and VM I/O configuration statements in the same file. The IOCP source file must be separate from the VM I/O configuration files. The VM

I/O configuration files are the system configuration file (SYSTEM CONFIG) and the obsolete real I/O configuration file (HCPRIO). The VM I/O configuration files need to define only those devices that VM cannot sense during initial program load (IPL) of VM or those devices for which you need to specify definition parameters (for example, shared DASD).

As an alternative, the Hardware Configuration Manager (HCM) and the Hardware Configuration Definition (HCD) define the I/O configuration to the VM operating system and the I/O subsystem. You do not need to run IOCP directly to define the I/O configuration to the I/O subsystem. However, HCD does run IOCP when it needs to write an IOCDS.

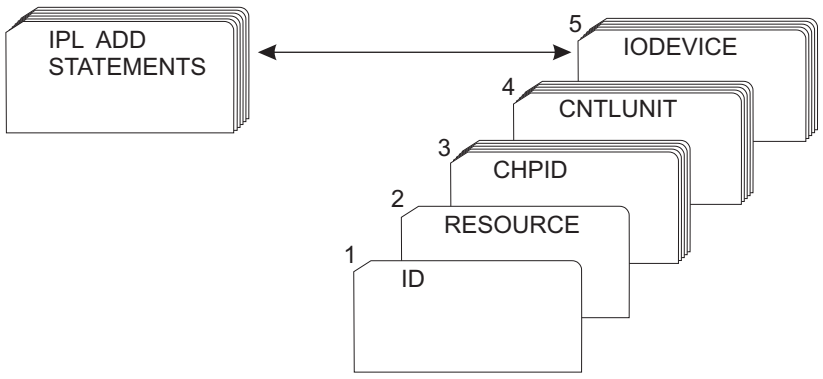


1. **ID** statement (optional) defines heading data, or titles, for configuration reports. Only one ID statement is allowed.
2. **RESOURCE** statement (required) defines the logical partitions and logical channel subsystems. Only one RESOURCE statement is allowed.
3. **CHPID** statements (optional) define channel paths. A VM I/O definition does not use a corresponding statement.
4. **CNTLUNIT** statements (optional) define control units. Each control unit must be defined in a separate CNTLUNIT statement. A VM I/O definition does not use a corresponding statement.
5. **IODEVICE** statements (optional) define I/O devices; a maximum of 256 I/O devices can be defined in an IODEVICE statement. The information in the IODEVICE statements corresponds to the information in the RDEVICE statements in the SYSTEM CONFIG file or the RDEVICE statements in the obsolete HCPRIO file.

Figure 2-2. Correspondence between IOCP Statements and SYSTEM CONFIG Statements or HCPRIO Statements

IOCP and VSE I/O Configuration

The information in VSE IPL ADD statements must correspond to information in IOCP IODEVICE statements (see Figure 2-3 on page 2-5). Appendix B, “Lists of Statement Input” has sample IOCP statements and the corresponding VSE IPL ADD statements.



1. **ID** statement (optional) defines heading data, or titles, for configuration reports. Only one ID statement is allowed.
2. **RESOURCE** statement (required) defines the logical partitions and logical channel subsystems. Only one RESOURCE statement is allowed.
3. **CHPID** statements (optional) define channel paths. A VSE I/O configuration does not use a corresponding statement.
4. **CNTLUNIT** statements (optional) define control units. Each control unit must be defined in a separate CNTLUNIT statement. A VSE I/O configuration does not use a corresponding statement.
5. **IODEVICE** statements (optional) define I/O devices. A maximum of 256 I/O devices can be defined in an IODEVICE statement. Information in the IODEVICE statements must correspond to information in the VSE IPL ADD statements.

Figure 2-3. Correspondence between IOCP Statements and VSE IPL ADD Statements

IOCP Definitions

The following is a list of IOCP terms that you can refer to when you define your I/O configuration:

Access List
Defines the names of the logical partition (LP) or logical partitions (LPs) that will have the channel path configured online at LP activation following **initial** power-on reset of an IOCDS.

Candidate List
Defines the names of the logical partition (LP) or logical partitions (LPs) that can configure the channel path following LP activation.

Device Candidate List
Defines the names of the logical partition (LP) or logical partitions (LPs) that can access the device following LP activation.

Director
An ESCON or FICON switch that provides a control unit port (CUP) which is accessed through link address 'FE'x.

ESCON Channel Path
IOCP defines the following channel path types (TYPE keyword) as ESCON channel paths:

- ESCON channel (CNC)

- ESCON channel that supports channel-to-channel communications (CTC)
- FICON channel attached to an ESCON Director (FCV).

ESCON Control Unit
A control unit that attaches to CNC, CTC, or FCV channel paths (TYPE keyword). An ESCON control unit can also attach to FC channel paths.

ESCON CTC Control Unit
An ESCON CTC control unit is one of the following:

- A control unit that attaches to only TYPE=CTC channel paths
- A control unit that attaches to only TYPE=CNC or TYPE=FCV channel paths and has UNIT=SCTC coded.

FICON CTC Control Unit
A FICON CTC control unit is a control unit that attaches to only TYPE=FC channel paths and has UNIT=FCTC coded.

ESCON Device
A device assigned to CNC, CTC, or FCV channel paths (TYPE keyword).

FICON Channel Path
A TYPE=FC channel path.

FICON Director
A fibre channel switch that has a control unit port (CUP) and supports FC channel paths (TYPE keyword).

FICON Control Unit
A control unit that attaches to only FC channel paths (TYPE keyword).

FICON Device
A device assigned to only FC channel paths (TYPE keyword).

Parallel Channel Path
IOCP defines the following channel path types (TYPE keyword) as parallel channel paths:

- ESCON channel (CVC) that attaches to a 9034 ESCON Converter Model 1 or similar converter and operates as a block multiplexer channel.
- ESCON channel (CBY) that attaches to a 9034 ESCON Converter Model 1 or similar converter and operates as a byte multiplexer channel.

Parallel Control Unit
A control unit that attaches to CBY or CVC channel paths (TYPE keyword).

Parallel Device
A device assigned to CBY or CVC channel paths (TYPE keyword).

Spanned Channel Path
IOCP defines a spanned channel path as a channel path that can be accessed by logical partitions in more than one logical channel subsystem (CSS) at the same time. To define a spanned channel path, specify more than one CSS ID in the CSS parameter of the PATH keyword on the CHPID statement. A spanned channel path is also a shared channel path.

Shared Channel Path
IOCP defines a shared channel path as a channel path that can be accessed by more than one logical partition in the same logical channel subsystem (CSS) at the same time. To define a shared channel path, do one of the following:

- Specify the SHARED, NOTPART, or IOCLUSTER keyword on the CHPID statement

- Specify more than one logical partition in the access list of the PARTITION keyword on the CHPID statement.
- Define the channel path as spanned by specifying more than one CSS ID in the CSS parameter of the PATH keyword on the CHPID statement.

Reconfigurable Channel Path

IOCP defines a reconfigurable channel path as an unshared channel path that can be dynamically moved between logical partitions. To define a reconfigurable channel path, specify the REC parameter in the PARTITION keyword on the CHPID statement.

Dedicated Channel Path

IOCP defines a dedicated channel path as a channel path that can be accessed by only one logical partition and cannot be moved between logical partitions. A dedicated channel path is unshared and non-reconfigurable. To define a dedicated channel path, do not specify SHARED, NOTPART, or REC in the CHPID statement and do one of the following:

- Specify a single logical partition in the access list of the PARTITION keyword in the CHPID statement
- Specify a null access list and a single logical partition in the candidate list of the PARTITION keyword in the CHPID statement.

ID

ID is an optional statement that describes the identification information printed in the heading of IOCP configuration reports on the ID1 and ID2 lines. It is also the source of the customer name (data set name) for the IOCDS that appears on the Input/Output Configuration panel for CPCs. See Chapter 7, “IOCP Configuration Reports” for examples of the headings used on the reports.

When specified, the ID statement must precede all RESOURCE, CHPID, CNTLUNIT, and IODEVICE statements in the input stream. Also, when specified, it must have at least one keyword specified (for example, MSG1, MSG2, or SYSTEM). The ID statement can be specified only once in the input file. The ID statement parameters can appear in any order but you must code at least one parameter. If you do not specify the ID statement, no identifying information is printed on the ID1 and ID2 lines of the report headings.

See Appendix A, “Coding IOCP Statements” for a summary of the rules for coding statements and the notation used in this document to illustrate statements.

The format of the ID statement is as follows:

```
[symbol]   ID    {MSG1='message'}
                 {MSG2='message'}
                 {SYSTEM=(processor[,number])}
                 {TOK='value'}
```

MSG1=

specifies the identification information that is printed on the ID1 line of the heading on IOCP configuration reports. The support element also uses the first eight characters of MSG1= (bytes 1-8) as the customer name for the IOCDS that appears on the Input/Output Configuration panel for CPCs.

MSG2=

specifies the identification information that is printed on the ID2 line of the heading on IOCP configuration reports.

'message'

specifies a string of 1-64 characters of identification information. IOCP accepts any character in the string. Any incorrect character is translated to a double quote. See the "English (U.S.) I/O Interface Code" table for EBCDIC characters in *3270 IDS Character Set Reference* for a list of valid printable characters. You must enclose the string within single quotation marks. Two consecutive single quotation marks are counted as one character and indicate a single quotation mark within the string (such as, `MSG1='John''s I/O Report'`).

SYSTEM=

specifies the machine limits and rules that IOCP enforces for verification of the IOCP input or when writing an IOCDS in preparation of a CPC upgrade. The stand-alone version of IOCP ignores the SYSTEM keyword. It is also ignored when IOCP is writing an IOCDS using keyword CHECKCPC=YES in the PARM parameter of the EXEC statement (z/OS or VSE) or CMS option CHECKCPC. In both cases, IOCP uses the machine limits and rules for the CPC on which IOCP is currently running.

When IOCP is writing an IOCDS in preparation of a CPC upgrade (keyword CHECKCPC=NO or option NOCHKCPC is specified), IOCP uses the machine limits and rules based on the SYSTEM keyword. IOCP requires the SYSTEM keyword when CHECKCPC=NO or NOCHKCPC is specified.

If the SYSTEM keyword is not specified and ICP IOCP runs on a CPC that it supports, IOCP uses the machine limits for that CPC. If the SYSTEM keyword is not specified and ICP IOCP runs on an unsupported CPC, IOCP uses the machine limits associated with SYSTEM=(2084,1).

See Appendix F, "Machine Limits and Rules" for a complete list of valid SYSTEM keyword values and their associated machine limits and rules.

processor

specifies the processor machine type number of the target CPC for which the IOCP input is to be verified. For example, specify SYSTEM=(2084) if the IOCP input you need verified is for a 2084 CPC.

number

specifies the machine limits number associated with the target CPC machine type for which the IOCP input is to be verified. Specify a single decimal number. The default value is the lowest number supported for the specified CPC machine type. For example, the default machine limits number for the 2084 is one.

TOK=*value*

Configuration programs use this keyword to pass to the CPC information required to enable the dynamic I/O configuration capability of any resulting IOCDS. This keyword is not intended for direct IOCP user input. It is mentioned here to inform you that IOCP accepts the keyword and the generated value.

For HCD

You should never alter an IOCP input file generated by HCD and use it to write an IOCDS. If changes are necessary, use HCD to regenerate the IOCP input.

ID Statement Coding Example

The following statement defines the identification information printed on lines ID1 and ID2 on the heading of IOCP configuration reports. TPCONFIG is your name for the IOCDS that appears on the I/O configuration panel. You have a 2084 Model A08 Central Processor Complex and have selected the appropriate machine limits and rules for your processor with the SYSTEM keyword.

```
ID00B ID MSG1='TPCONFIG Configuration for Processor',        X
               MSG2='Revised by Plan 3',                     X
               SYSTEM=(2084,1)
```

RESOURCE

RESOURCE is a required statement that defines:

- Logical partition names
- MIF image ID numbers assigned to the logical partitions
- Logical channel subsystems (CSSs)
- The maximum number of devices that can be dynamically defined for a dynamic-capable IOCDS
- Reserved logical partitions, for a dynamic-capable IOCDS.

The RESOURCE statement must:

- Appear only once in an IOCP input file
- Follow the ID statement (if specified)
- Precede all CHPID, CNTLUNIT, and IODEVICE statements
- Include every logical partition in the configuration
- Have either the PART or PARTITION parameter specified.

If the RESOURCE statement is not specified or is in error, IOCP terminates all processing and does not validate the remaining IOCP statements.

See Appendix A, “Coding IOCP Statements” for a summary of the rules for coding statements and the notation used in this document to illustrate statements.

The format of the RESOURCE statement is as follows:

```
[symbol]     RESOURCE   PART|PARTITION=((CSS(ccsid),{name|({name|*}
                            [,MIF image ID])},...),...)
                        [MAXDEV=((CSS(cssid),ss[,ss]),...)]
```

PART=
PARTITION=

specifies the logical partitions (LPs) in the configuration. While you can use either form of the keyword, you must choose one form and specify it in the RESOURCE statement.

ccsid specifies the logical channel subsystem (CSS) ID to define. The CSS ID is a one-digit number in the range 0-n. See Table F-3 on page F-5 to determine the maximum CSS ID your CPC supports.

All the logical partitions following a CSS ID parameter are defined in the CSS. You can define as many CSSs as your CPC supports.

If you are defining only CSS 0, the CSS parameter is optional. Also, if you are defining only a single CSS, the PART or PARTITION parameter can be enclosed in a single set of parentheses. For example:

```
PART=(CSS(1),LP1)
```

name specifies the name of the logical partition (LP) to be defined. The LP name is a 1-8 alphanumeric (0-9, A-Z) character name that must have a non-numeric first character.

The words PHYSICAL, REC, SYSTEM, and PRIM*nnnn* (where *nnnn* is a 4-digit decimal number) are reserved and cannot be used as the names of LPs.

You must specify all LPs in the configuration. You can define up to 15 LPs in a CSS. Each LP name in the configuration must be unique. See Table F-3 on page F-5 to determine the maximum number of LPs your CPC supports.

A logical partition specified on the RESOURCE statement can exist without any channel paths assigned to it.

For z/OS

For coupling facility logical partitions (LPs), IBM recommends the LP name specified in the PART or PARTITION keyword of the RESOURCE statement match the NAME keyword of the CF statement in the policy information defined for the site's coupling facility resource management (CFRM) policy.

***** specifies reserving a logical partition (LP) in the specified CSS with the specified MIF image ID. A reserved LP can be specified only for a dynamic-capable IOCDS (TOK keyword on ID statement). A dynamic-capable IOCDS is built when using HCD on OS/390, z/OS, or VM or when specifying IOCP CMS utility option DYN for VM. Space in the hardware system area (HSA) is allocated for reserved LPs but cannot be used until a dynamic I/O configuration change is made to assign a name and other resources to the LP.

The following rules apply when specifying reserved LPs:

- A reserved LP must have a user-specified MIF image ID.
- A reserved LP cannot have any channel paths assigned to it.
- An IOCDS cannot contain only reserved LPs.
- At least one LP must be defined with a name.

MIF image ID

specifies the MIF (multiple image facility) image ID associated with a logical partition (LP). The MIF image ID is a one-digit hexadecimal number in the range 1-F. You can specify the MIF image IDs non-consecutively in any order. MIF image IDs must be unique within a CSS but can be duplicated in different CSSs.

Shared channel paths used for ESCON CTC or FICON CTC communication require a MIF image ID. See the CUADD keyword on page 2-35 for more information.

If you do **not** specify a MIF image ID for every LP, IOCP arbitrarily assigns MIF image IDs to the unassigned LPs.

The MIF image ID is different from the logical partition identifier (ID) displayed on the General page of the image profile for CPCs.

For z/OS

For coupling facility logical partitions (LPs), the partition ID specified on the activation profile for the CF image on the support element must match the number specified in the PARTITION keyword of the CF statement in the policy information defined for the site's coupling facility resource management (CFRM) policy. IBM recommends that the partition ID specified is a concatenation of the CSS ID and MIF image ID. The MIF image ID is no longer used for this purpose.

MAXDEV=

specifies the maximum number of devices, including those defined in the IOCDS, that can be dynamically added to the configuration.

If the MAXDEV keyword is specified, the IOCDS must be dynamic-capable (TOK keyword on ID statement). A dynamic-capable IOCDS is built when using HCD on OS/390, z/OS, or VM or specifying IOCP CMS utility option DYN for VM.

If the MAXDEV keyword is not specified for a dynamic-capable IOCDS, IOCP defaults the maximum number of devices to the maximum the CPC supports for subchannel set 0 for each defined CSS. If you define devices in subchannel set 1 of any CSS, IOCP sets the default for the maximum number of devices for each subchannel set 1 with devices to the maximum the CPC supports. Otherwise, subchannel set 1 has a default value of zero.

If the MAXDEV keyword is specified for a dynamic-capable IOCDS but omits a defined CSS, IOCP sets the default for the maximum number of devices to the maximum the CPC supports for subchannel set 0 for the CSS. If you define devices in subchannel set 1 of the omitted CSS, IOCP sets the default for the maximum number of devices for subchannel set 1 to the maximum the CPC supports. Otherwise, subchannel set 1 has a default value of zero.

cssid specifies the logical channel subsystem (CSS) ID associated with this parameter. The CSS ID is a one-digit number in the range 0-n. See Table F-3 on page F-5 to determine the maximum CSS ID your CPC supports.

The CSS ID must have been defined in the PART or PARTITION keyword on the RESOURCE statement. You can specify as many CSSs as you defined. If only a single CSS was defined, the CSS parameter is optional. Also, if you only specify a single CSS, the MAXDEV parameter can be enclosed in a single set of parentheses. For example:

```
MAXDEV=(CSS(1),60K)
```

ss specifies the maximum number of devices, including those defined in the IOCDS, that can be used for dynamic I/O configuration in a subchannel set in a CSS. The first *ss* value defines the maximum number of devices for subchannel set 0 in a CSS, and the second *ss* value defines the maximum number of devices for subchannel set 1 in the same CSS. See Table F-3 on page F-5 to determine the number of subchannel sets your CPC supports. All CPCs support subchannel set 0.

To specify a value for subchannel set 1, you must also specify a value for subchannel set 0.

The format of *ss* is:

{*number* | **MIN** | **MAX**}

number
specifies the maximum number of devices, including those defined in the IOCDS, that can be used for dynamic I/O configuration in a subchannel set in a CSS. The number can be a one- to five-digit decimal number in the range 0-*n* where *n* is the maximum number of devices your CPC supports for the subchannel set. The number can also be in the form *nn*K where *nn* is a one- or two-digit decimal number that is multiplied by 1024 to get the maximum number of devices (for example, 60K and 61440 are equivalent values). See Table F-3 on page F-5 to determine the maximum number of devices per subchannel set that your CPC supports. The configuration cannot contain more devices than the MAXDEV value.

MIN specifies that the maximum device value in the I/O configuration is equal to the number of devices defined in the IOCDS for the subchannel set in the CSS. Therefore, no new devices can be dynamically added to the I/O configuration for the subchannel set in the CSS unless other devices have been deleted.

MAX specifies that the maximum device value in the I/O configuration for the subchannel set in the CSS is equal to the maximum number of devices supported by your CPC for the subchannel set (see Table F-3 on page F-5).

RESOURCE Statement Coding Examples

Example 1:

```
RESOURCE PART=((LP2,2),(LP1,1),(LP3,3))
```

The preceding statement:

- Defines logical channel subsystem (CSS) 0
- Defines three logical partitions in CSS 0: LP1, LP2, and LP3
- Assigns MIF image ID number 1 to LP1, MIF image ID number 2 to LP2, and MIF image ID number 3 to LP3.

Example 2:

```
RESOURCE PART=(CSS(1),(LP1,2),LP2,(LP3,5))
```

The preceding statement:

- Defines CSS 1
- Defines three logical partitions in CSS 1: LP1, LP2, and LP3
- Assigns MIF image ID number 2 to LP1, MIF image ID number 5 to LP3, and IOCP arbitrarily assigns a MIF image ID number to LP2.

Example 3:

```
RESOURCE PART=((CSS(0),(LP1,1),LP2),(CSS(1),(LPA,1),(*,5),(LPB,F))),
           MAXDEV=((CSS(0),40K,12K),(CSS(1),56820))
```

The preceding statement:

- Defines CSSs 0 and 1
- Defines two logical partitions in CSS 0: LP1 and LP2

- Defines two logical partitions and reserves space for one other logical partition in CSS 1: LPA and LPB are defined and one logical partition is reserved until a future dynamic I/O change assigns a name to the logical partition.
- Assigns MIF image ID number 1 to LP1 and LPA, MIF image ID number F to LPB, MIF image ID number 5 to the reserved logical partition in CSS 1, and IOCP arbitrarily assigns a MIF image ID number to LP2.
- Specifies that the maximum number of devices that can be defined, including dynamic I/O additions, in the configuration for CSS 0 is 40960 for subchannel set 0 and 12288 for subchannel set 1 and for CSS 1 is 56820 for subchannel set 0. Assuming that there are no devices defined in subchannel set 1 in CSS 1, the maximum number of dynamic I/O additions for subchannel set 1 is zero (that is, no dynamic I/O additions are allowed).

CHPID

CHPID is an optional statement that defines:

- Channel path identifiers (*chpids*)
- Physical channel identifiers (*pchids*)
- Channel path types
- *chpid* assignment to ESCON and FICON Directors
- Availability of *chpids* to logical partitions
- Reconfigurability of *chpids* among logical partitions
- Shared *chpids* for logical partitions
- Spanned *chpids* for logical channel subsystems.

When specified, the CHPID statement must:

- Follow the ID statement (if specified) and the RESOURCE statement
- Precede any CNTLUNIT statements that refer to the *chpid* it defines
- Collectively, specify all *chpids* to use in the configuration.

Channel paths not specified in a CHPID statement cannot be used.

See Appendix A, “Coding IOCP Statements” for a summary of the rules for coding statements and the notation in this document to illustrate statements.

The format of the CHPID statement is as follows:

```
[symbol] CHPID    PATH=(CSS(cssid[,cssid]...),chpid number)
                  [PCHID=number]
                  TYPE={CBY | CVC | CNC | CTC | CFP | CFR | CFS |
                        CBP | CBR | CBS | ICP | OSC | OSD | OSE |
                        OSN | FC  | FCV | FCP | IQD}
                  [SWITCH=number]
                  [PART | PARTITION={(CSS(cssid),{name|0}[,REC])|
                        (CSS(cssid),access list)|
                        (CSS(cssid),(access list)[,(candidate list)][,REC])|
                        ((CSS(cssid),(access list)[,(candidate list)]),...)}]
                  [NOTPART={(CSS(cssid),access list)|
                        ((CSS(cssid),(access list)[,(candidate list)]),...)}]
                  [SHARED]
                  [CPATH=(CSS(cssid),chpid number)]
                  [CHPARM=value]
                  [IOCLUSTER=name]
```

PATH=

ccsid
specifies the logical channel subsystem (CSS) associated with this parameter. A CSS ID is a one-digit number in the range 0-n. See Table F-3 on page F-5 to determine the maximum CSS ID your CPC supports.

The CSS IDs must have been defined in the PART or PARTITION keyword on the RESOURCE statement. You can specify as many CSSs as you defined. If only a single CSS was defined, the CSS parameter is optional.

If you specify multiple CSS IDs for a channel path, IOCP defines the channel path as spanned. A spanned channel path is available for use by the logical partitions in each specified CSS. Only FC, FCP, CFS, CFP, CBS, CBP, ICP, OSC, OSD, OSE, OSN, and IQD channel paths (TYPE keyword) can be spanned. See Appendix F, “Machine Limits and Rules,” on page F-1 to determine which channel path types your CPC supports being spanned.

chpid number
specifies a two-digit hexadecimal channel path ID (*chpid*) number for the channel path for each CSS ID specified in the CSS parameter. A *chpid* cannot be duplicated within a CSS. See Appendix F, “Machine Limits and Rules” to determine the valid *chpid* ranges your CPC supports.

PCHID=*number*
specifies the physical channel identification (*pchid*) number associated with the channel path. The *pchid* number is a one- to three-digit hexadecimal number in the range 0-*n* where *n* is the maximum number your CPC supports. See Appendix F, “Machine Limits and Rules” to determine the maximum *pchid* number your CPC supports.

The *pchid* number identifies the physical location (cage, slot, card port) for a channel path in the CPC. The CPC maintains this mapping. It can be changed as in the case of ESCON port sparing (that is, one card port goes bad so the CPC enables the spare port and assigns the *pchid* number to the new port).

The PCHID keyword is not allowed for internal channel paths ICP and IQD (TYPE keyword). The PCHID keyword is required for all other channel path types. The keyword is optional when performing a deck verification. It is required when writing an IOCDS. IOCP can validate an IOCP input file without *pchids* by performing a deck verification (WRTCDS=NO or NOWRTCDS). The PCHIDs available for your CPC’s I/O configuration can be found on the PCHID Report (see “Using a PCHID Report to Help Plan Your I/O Configuration” on page 1-9). You can either use the PCHID Report and assign *pchid* numbers to channel paths or use the CHPID Mapping Tool. The CHPID Mapping Tool available from Resource Link at *www.ibm.com/servers/resourcelink* can use the IOCP input file and add the appropriate *pchid* numbers for your configuration to the CHPID statements. IOCP can then use the input file to write an IOCDS.

Note: An IOCP input file that HCD created without *pchids* must be migrated back into HCD after the CHPID Mapping Tool has added *pchid* numbers to the file. HCD can then write an IOCDS, or a new IOCP input file can then be created from HCD that stand-alone IOCP can use to write an IOCDS.

TYPE=
specifies the mode of I/O operation for the channel path. See Appendix F, “Machine Limits and Rules” to determine which channel path types your CPC supports.

CBY
specifies that the channel path is an ESCON channel that attaches to a 9034 ESCON Converter Model 1 or similar converter. IOCP defines CBY channel paths as parallel channel paths.

CBY channel paths operate the same as parallel byte multiplexer channel paths. They operate in burst mode or byte-interleave mode, depending on the attached control unit.

Notes:

1. CBY channel paths require ESCON channel hardware.
2. If you define an ESCON channel as CBY but do not attach it to an ESCON Converter, the channel is put into a permanent standby error state at POR. Put the channel in single channel service mode before POR to avoid the channel error. However, the channel is still unusable until it is attached to an ESCON Converter.

CVC
specifies that the channel path is an ESCON channel that attaches to a 9034 ESCON Converter Model 1 or similar converter. IOCP defines CVC channel paths as parallel channel paths.

CVC channel paths operate the same as parallel block multiplexer channel paths. They operate only in burst mode and allow multiplexing between blocks. See Figure E-9 on page E-10 for CVC channel path coding examples.

Notes:

1. CVC channel paths require ESCON channel hardware.
2. If you define an ESCON channel as CVC but do not attach it to an ESCON Converter, the channel is put into a permanent standby error state at POR. Put the channel in single channel service mode before POR to avoid the channel error. However, the channel is still unusable until it is attached to an ESCON Converter.

CNC
specifies that the channel path is an ESCON channel, and that all control units and I/O devices that attach to this channel path support the ESCON Architecture protocol. See Appendix E, “Configuration Examples” for CNC channel path coding examples.

CTC
specifies that the channel path is an ESCON channel that permits channel-to-channel communications. See Appendix E, “Configuration Examples” for CTC channel path coding examples.

A CTC channel path communicates with CNC channel paths and, conversely, a CNC channel path communicates with CTC channel paths. A CTC channel path cannot communicate with another CTC channel path, nor can a CNC channel path communicate with another CNC channel path.

Notes:

1. You must specify identical unit addresses in the CNTLUNIT statements for CTC and CNC channel paths that communicate with each other.
2. You must specify the MIF image ID or logical partition numbers associated with shared CNC and CTC channel paths in the CUADD keyword on the CNTLUNIT statements for the CTC communication. See *ESCON and FICON Channel-to-Channel Reference*, SB10-7034, for more information.

3. When specifying a control unit associated with an unshared CNC and CTC channel path, the CUADD keyword should not be used.

CFP
specifies that the channel path is a coupling facility peer channel. CFP channel paths are defined for ISC-3 links. Each CFP channel path assigned to a control unit should have 7 devices defined.

A CFP channel path connects to another CFP channel path.

CFR
specifies that the channel path is a coupling facility receiver channel. CFR channel paths are defined for ISC-3 links. You can define a CFR channel path only for a coupling facility logical partition to use.

A CFR channel path connects to a CFS channel path. A CFR channel path cannot connect to another CFR channel path.

CFS
specifies that the channel path is a coupling facility sender channel. CFS channel paths are defined for ISC-3 links. Each CFS channel path should have 2 devices defined.

A CFS channel path connects to a CFR channel path. A CFS channel path cannot connect to another CFS channel path.

CBP
specifies that the channel path is an Integrated Cluster Bus coupling facility peer channel. CBP channel paths are defined for ICB-3 and ICB-4 links. Each CBP channel path assigned to a control unit should have 7 devices defined.

A CBP channel path connects to another CBP channel path. However, an ICB-3 link must connect to another ICB-3 link and an ICB-4 link must connect to another ICB-4 link.

CBR
specifies that the channel path is an Integrated Cluster Bus coupling facility receiver channel. CBR channel paths are defined for ICB-2 links. You can define a CBR channel path only for a coupling facility logical partition to use.

A CBR channel path connects to a CBS channel path. A CBR channel path cannot connect to another CBR channel path.

CBS
specifies that the channel path is an Integrated Cluster Bus coupling facility sender channel. CBS channel paths are defined for ICB-2 links. Each CBS channel path should have 2 devices defined.

A CBS channel path connects to a CBR channel path. A CBS channel path cannot connect to another CBS channel path.

ICP
specifies that the channel path is an Internal Coupling facility peer channel. Each ICP channel path assigned to a control unit should have 7 devices defined.

An ICP channel path connects to another ICP channel path. You must connect every ICP channel path to another ICP channel path by specifying the CPATH keyword in the CHPID statement. You cannot connect an ICP channel path to itself.

See “Defining Internal Coupling Channels (TYPE=ICP)” on page 1-22 for recommendations on defining ICP channel paths.

OSC
specifies that the channel path is an open systems adapter (OSA) channel that operates as an OSA-Express integrated console controller (OSA-ICC). An OSC channel path provides 3270 sessions that can serve as the system operator or master console for an operating system so you can IPL.

OSA-ICC is supported only on OSA-Express and OSA-Express2 1000Base-T Ethernet cards. If an OSC channel path is specified on any other type of channel hardware, the I/O subsystem flags the channel path with a definition error and the channel path is unavailable until a dynamic I/O change is made or power-on reset is performed with a new IOCDS to resolve the error.

For more OSC channel path configuration information, see *Open Systems Adapter-Express Integrated Console Controller User's Guide*, SA22-7990.

Note: Devices assigned to OSC channel paths must be configured on the Support Element before use.

OSD
specifies that the channel path is an open systems adapter (OSA) channel supporting the Queued Direct I/O (QDIO) architecture. An OSD channel path supports IP applications providing connectivity to Gigabit Ethernet, 10 Gigabit Ethernet, 1000Base-T Ethernet, Fast Ethernet, and Token Ring LANs. OSD channel paths are defined for OSA-Express and OSA-Express2 features. All OSA channel hardware support OSD channel paths.

For more OSD channel path configuration information, see *Open Systems Adapter-Express Customer's Guide and Reference*, SA22-7935.

OSE
specifies that the channel path is an open systems adapter (OSA) channel that uses non-QDIO architectures. An OSE channel path provides connectivity for all LAN protocols supported by the non-QDIO architecture (1000Base-T Ethernet, Fast Ethernet, and Token Ring LANs). OSE channel paths are defined for OSA-Express and OSA-Express2 features. All OSA channel hardware except Gigabit Ethernet and 10 Gigabit Ethernet support OSE channel paths.

For more OSE channel path configuration information, see *Open Systems Adapter-Express Customer's Guide and Reference*, SA22-7935.

OSN
specifies that the channel path is an open systems adapter (OSA) channel for network control program (NCP). An OSN channel path supports traffic between an operating system image (for example, z/OS) and a Communication Controller for Linux (CCL) image. OSN channel paths are supported on OSA-Express2 features Gigabit Ethernet and 1000Base-T Ethernet.

For more OSN channel path configuration information, see *Open Systems Adapter-Express Customer's Guide and Reference*, SA22-7935.

FC
specifies that the channel path is a FICON channel and that all control units and I/O devices that attach to this channel path support the FICON Architecture protocol. All FICON channel hardware supports FC channel paths.

FC channel paths can communicate with each other in channel-to-channel communications. See Appendix E, “Configuration Examples” for an FC channel-to-channel coding example.

Notes on Defining FICON CTC Communication:

1. You must specify a control unit type (UNIT keyword) of FCTC for FC channel paths to communicate with each other.
2. You must specify identical unit addresses in the CNTLUNIT statements for FC channel paths that communicate with each other.
3. You must specify the CUADD keyword on the CNTLUNIT statements for CTC communication when the remote channel path is a shared FC channel path. If the remote channel path is on a CPC that does not support multiple logical channel subsystems, then the logical address specified must equal the partition number of the logical partition with which you want to communicate. If the remote channel path is on a CPC that does support multiple logical channel subsystems, then the logical address specified must equal the combination of the CSS ID and the MIF image ID of the logical partition with which you want to communicate, (for example, specify CUADD=15 for MIF image ID 5 in CSS 1). For additional information, see the *ESCON and FICON Channel-to-Channel Reference*, SB10-7034.
4. When specifying an FCTC control unit associated with an unshared FC channel path, the CUADD keyword should not be used.

FCV

specifies that the channel path is a FICON channel that attaches to an ESCON Director. IOCP defines FCV channel paths as ESCON channel paths. FCV channel paths operate the same way as ESCON channel paths.

Notes:

1. FCV channel paths require FICON Express LX channel hardware. If an FCV channel path is specified on any other type of channel hardware, including FICON Express2 LX, the I/O subsystem flags the channel path with a definition error and the channel path is unavailable until a dynamic I/O change is made or power-on reset is performed with a new IOCDS to resolve the error.
2. If you define a FICON channel as FCV but do not attach it to an ESCON Director, the channel is put into a permanent error state after POR. Put the channel in single channel service mode before POR to avoid the channel error. However, the channel is still unusable until it is attached to an ESCON Director.

FCP

specifies that the channel path is a FICON channel that operates as a fibre channel protocol channel. All FICON channel hardware supports FCP channel paths. See “Fibre Channel Protocol Support” on page 1-28 for more information on FCP channel paths.

IQD

specifies that the channel path is an internal queued direct communication (HiperSockets) channel. See “Defining IQD Channels” on page 1-28 for recommendations on defining IQD channel paths.

SWITCH=*number*

specifies an arbitrary number for the IBM 9032 or 9033 ESCON Director or a FICON Director to which the channel path is assigned. The number can range

from 00-FF for a maximum of 256 for each IOCDS. A channel path may be assigned to only one number. A FICON Director cannot have the same switch number as an ESCON Director.

For an ESCON channel path using multiple ESCON Directors, specify the switch number for the director that has dynamic connections for the channel path. For a FICON channel path, always specify the switch number of the entry switch. The entry switch is the switch to which the FICON channel actually connects. The switch number for a FICON Director is not the same as the switch address which is set up by using switch control panels. IBM recommends that you try to use the same value for switch numbers and switch addresses whenever possible to reduce the number of ways a director is known. For more information on defining FICON Directors, see "Defining FICON Switch Configurations" on page 1-30.

The SWITCH keyword is required as follows:

- For channel paths to have dynamic connections through a director
- For FCV channel paths (TYPE keyword)
- For managed channel paths (CHPARM keyword with, for example, a value of 01).

The SWITCH keyword is valid only for CBY, CVC, CNC, CTC, FCV, and FC channel paths (TYPE keyword). For ESCON Directors, the SWITCH keyword is valid for CBY, CVC, CNC, CTC, and FCV channel paths. However, CBY and CVC channel paths can have only dedicated connections through an ESCON Director. For FICON Directors, the SWITCH keyword is valid for FC channel paths. See Appendix E, "Configuration Examples" for SWITCH keyword coding examples.

If you specify the SWITCH keyword for an FC channel path (TYPE keyword) that does not attach to a FICON Director, or if you do not specify the SWITCH keyword for an FC channel path that does attach to a FICON Director, the I/O subsystem flags the channel path with a definition error. The channel path is unavailable until the channel path is attached to or detached from a FICON Director to match the configuration definition and the channel path is varied off and on, or until a dynamic I/O change is made or power-on reset is performed with a new IOCDS to resolve the error.

PART=
PARTITION=

specifies the availability of *chpids* to logical partitions. All logical partition names and CSS IDs that you specify must match those specified in the RESOURCE statement.

You must specify the PART, PARTITION, NOTPART, SHARED, or IOCLUSTER keyword in every CHPID statement or define the channel path as spanned (PATH keyword). You can specify the PART or PARTITION keyword and the SHARED or NOTPART keywords in the same CHPID statement. However, you **cannot** specify the PART or PARTITION and NOTPART keywords for the same CSS ID in the same CHPID statement.

Either form of this keyword can be used in a CHPID statement. However, only one form of this keyword can be in each statement.

ccsid

specifies the logical channel subsystem (CSS) ID associated with this

parameter. The CSS ID is a one-digit number in the range 0-*n*. See Table F-3 on page F-5 to determine the maximum CSS ID your CPC supports.

Each CSS ID must have been specified in the PATH keyword for this channel path. You can specify as many CSSs as you specified in the PATH keyword. If only a single CSS ID was specified in the PATH keyword, the CSS parameter is optional. If the channel path is spanned and more than one CSS was specified in the PATH keyword, the CSS parameter is required.

name
specifies the name of a logical partition (LP) that can access the channel path. The LP name is a 1-8 alphanumeric (0-9, A-Z) character name that must have a non-numeric first character and must have been defined on the RESOURCE statement. You cannot specify a reserved logical partition (*).

0 specifies that no LPs can access the channel path following LP activation for the initial POR of the IOCDS. The zero indicates a null access list.

If you specify a zero without parentheses, you cannot specify a candidate list and you must do one of the following:

- Specify the SHARED keyword for a shared channel path
- Specify multiple CSS IDs in the PATH keyword for a spanned channel path
- Specify the REC parameter for a reconfigurable channel path.

access list
specifies the logical partition (LP) or logical partitions (LPs) in the CSS that have the channel path configured online at LP activation following ***initial*** power-on reset (POR) of an IOCDS.

After the initial POR of an IOCDS, PR/SM LPAR retains which LPs will have the channel path configured online at LP activation following subsequent PORs of the IOCDS. In this case, the access list used to build an IOCDS may ***not*** necessarily match the access list PR/SM LPAR retains.

LPs that are ***not*** specified in the access list of a shared, spanned, or reconfigurable channel path can access the channel path after POR through channel reconfiguration commands if the LP is specified in the channel path's candidate list (see *candidate list* on page 2-21).

The format of the access list is:

```
{name[,name]...|0}
```

name
See *name* on page 2-20.

0 specifies that ***no*** LPs in the CSS will access the channel path following LP activation for the initial POR of the IOCDS. The zero indicates a null access list.

The following rules apply when specifying the access list:

- If you specify more than one LP name, IOCP defines the channel path as shared. Only CNC, CTC, CFS, CFP, CBS, CBP, ICP, OSC, OSD, OSE, OSN, FCV, FC, FCP, and IQD channel paths (TYPE keyword) can be shared.
- If you specify a zero for a null access list in a CSS, you cannot specify a logical partition name for the same CSS.

- If you specify either one LP name or a zero (a zero indicates a null access list), the channel path can be shared, reconfigurable, or dedicated (unshared and non-reconfigurable).
- If you specify a zero as the access list (null access list), you must do one of the following:
  - Specify the SHARED keyword for a shared channel path
  - Specify multiple CSS IDs in the PATH keyword for a spanned channel path
  - Specify the REC parameter for a reconfigurable channel path
  - Specify a candidate list consisting of one LP name for a dedicated channel path.
- An LP name can appear only once in an access list.

candidate list
specifies the logical partitions (LPs) in the CSS that can access the channel path. LPs that are ***not*** specified in a channel path's candidate list ***cannot*** access the channel path.

If you specify a candidate list, you do ***not*** need to repeat the LP names specified in the access list. IOCP automatically includes in the candidate list the LP names specified in the access list.

The format of the candidate list is:

{*name*[,*name*]...|=}

name
See *name* on page 2-20.

= specifies that the channel path's candidate list for the CSS is identical to its access list.

The following rules apply when specifying the candidate list:

- You ***cannot*** specify an equal sign (=) for a channel path's candidate list if the access list is zero (0 indicates a null access list).
- If you do ***not*** specify a candidate list for a CSS to which the channel path is assigned and the channel path is shared, spanned, or reconfigurable, the candidate list defaults to all LPs defined in each CSS to which the channel path is assigned excluding reserved logical partitions (*).
- If you do ***not*** specify a candidate list and the channel path is dedicated, the candidate list defaults to the LP specified in the access list.
- If a dedicated channel path has a zero specified as the access list (null access list), you must specify a candidate list of exactly one LP name.
- If the candidate list consists of more than one LP name, the channel path must either be shared, spanned, or reconfigurable.
- An LP name can appear only once in a candidate list.

REC
specifies that the channel path is reconfigurable. Specifying a channel path as reconfigurable allows it to be dynamically moved between logical partitions (LPs) in a CSS after power-on reset (POR) is complete using channel reconfiguration commands.

The following rules apply when specifying the REC parameter for a channel path:

- The channel path must have an access list of one LP name or zero (0 indicates a null access list).
- If a candidate list is specified, it must consist of one or more LP names.
- If the candidate list is ***not*** specified, it defaults to all LPs defined in the CSS excluding reserved LPs (*).
- You ***cannot*** specify:
  - The REC parameter and the SHARED keyword
  - The REC parameter and an access list of more than one LP
  - The REC parameter for a spanned channel path
  - An access list of one LP and a candidate list with an LP other than the one in the access list without specifying either the REC parameter or the SHARED keyword, or defining the channel path as spanned.
  - A zero as the access list (null access list) and a candidate list of two or more LPs without specifying either the REC parameter or the SHARED keyword or defining the channel path as spanned.
  - A zero as the access list (null access list) and no candidate list without specifying either the REC parameter or the SHARED keyword or defining the channel path as spanned.

NOTPART=

specifies the availability of *chpids* to logical partitions. All logical partition names and CSS IDs that you specify must match those specified in the RESOURCE statement.

You must specify the NOTPART, PART, PARTITION, SHARED, or IOCLUSTER keyword in every CHPID statement or define the channel path as spanned (PATH keyword). You can specify the NOTPART keyword and the SHARED, PART, or PARTITION keywords in the same CHPID statement. However, you ***cannot*** specify the NOTPART and PART or PARTITION keywords for the same CSS ID in the same CHPID statement.

The NOTPART keyword indicates that the channel path is shared. Only CNC, CTC, CFS, CFP, CBS, CBP, ICP, OSC, OSD, OSE, OSN, FCV, FC, FCP, and IQD channel paths (TYPE keyword) can be shared.

ccsid

specifies the logical channel subsystem (CSS) ID associated with this parameter. The CSS ID is a one-digit number in the range 0-*n*. See Table F-3 on page F-5 to determine the maximum CSS ID your CPC supports. If the channel path is spanned and more than one CSS ID was specified in the PATH keyword, the CSS parameter is required.

Each CSS ID must have been specified in the PATH keyword for this channel path. You can specify as many CSSs as you specified in the PATH keyword. If only a single CSS was specified in the PATH keyword, the CSS parameter is optional.

access list

specifies the logical partition (LP) or logical partitions (LPs) in a CSS that will ***not*** have the channel path configured online at LP activation following ***initial*** power-on reset (POR) of an IOCDS.

IOCP generates an access list for the channel path consisting of all LPs in the CSS ***not*** specified in the NOTPART access list. For example, if a CSS has three LPs (LP1, LP2, and LP3) and you specify `NOTPART=LP2`, IOCP generates an access list containing LP1 and LP3.

After the initial POR of an IOCDS, PR/SM LPAR retains which LPs will have the channel path configured online at LP activation following subsequent PORs of the IOCDS. In this case, the access list used to build an IOCDS may ***not*** necessarily match the access list PR/SM LPAR retains.

LPs that are ***not*** specified in the access list of a shared, spanned, or reconfigurable channel path can access the channel path after POR through channel reconfiguration commands if the LP is specified in the channel path's candidate list (see *candidate list* on page 2-23).

The format of the access list is:

`{name[,name]...|0}`

name
specifies the name of a logical partition (LP) that ***cannot*** access the channel path. The LP name is a 1-8 alphanumeric (0-9, A-Z) character name that must have a non-numeric first character and must have been defined on the RESOURCE statement. You cannot specify a reserved logical partition (*).

0 specifies that ***no*** LPs in the CSS access the channel path following LP activation for the initial POR of the IOCDS. A zero indicates a null access list.

The following rules apply when specifying the access list:

- If you specify all LP names in a CSS or a zero, ***no*** LPs in the CSS will access the channel path (IOCP generates a null access list) following LP activation for the initial POR of the IOCDS.
- If you specify a zero for a null access list in a CSS, you cannot specify a logical partition name for the same CSS.
- If you specify a NOTPART candidate list, you do not need to repeat in the NOTPART access list the LP names specified in the NOTPART candidate list. IOCP automatically excludes from the generated access list the LP names specified in the NOTPART candidate list.

  For example, if a CSS has three LPs (LP1, LP2, and LP3) and you specify `NOTPART=((LP2),(LP3))`, IOCP generates an access list containing LP1.
- An LP name can appear only once in an access list.

candidate list
specifies the logical partitions (LPs) in the CSS that ***cannot*** access the channel path.

IOCP generates a candidate list for the channel path consisting of all LPs in the CSS ***not*** specified in the NOTPART candidate list. For example, if a CSS has three LPs (LP1, LP2, and LP3) and you specify `NOTPART=((LP2),(LP3))`, IOCP generates a candidate list containing LP1 and LP2.

LPs that are ***not*** in the candidate list IOCP generates ***cannot*** access the channel path.

The format of the candidate list is:

`{name[,name]...|=}`

name
See *name* on page on page 2-23.

= specifies that the channel path's candidate list is identical to its access list.

The following rules apply when specifying the NOTPART candidate list:

- You ***cannot*** specify an equal sign (=) for a channel path's candidate list if the access list is zero (0 indicates a null access list).
- You ***cannot*** specify all LP names in a CSS because this would generate a null candidate list for the CSS.
- If you do ***not*** specify a candidate list for a CSS to which the channel path is assigned for the NOTPART keyword, the candidate list IOCP generates defaults to all LPs defined in the CSS(s) excluding reserved logical partitions (*).
- An LP name can appear only once in a candidate list.

SHARED
specifies that the channel path on the CHPID statement is shared. The SHARED keyword is valid only for CNC, CTC, CFS, CFP, CBS, CBP, ICP, OSC, OSD, OSE, OSN, FCV, FC, FCP, and IQD channel paths.

You must specify the SHARED, PART, PARTITION, NOTPART, or IOCLUSTER keyword in every CHPID statement or define the channel path as spanned (PATH keyword).

A shared channel path can be accessed by more than one logical partition (LP) at the same time. Unshared channel paths can be accessed only by a single LP. Although a reconfigurable channel path can be dynamically moved between LPs, only a single LP can access it at any given time.

The following rules apply to shared channel paths:

- If a channel path has an access list of more than one LP or the NOTPART keyword is specified for it, the channel path defaults to shared.
- A spanned channel path (PATH keyword) defaults to shared.
- If you specify SHARED without the PART or NOTPART keywords, the access and candidate lists default to all LPs defined in the CSSs to which the channel path is assigned excluding reserved logical partitions (*).
- You ***cannot*** specify:
  - SHARED for reconfigurable channel paths
  - An access list of one LP and a candidate list with an LP other than the LP in the access list with the PART or PARTITION keyword without specifying either the REC parameter, the SHARED keyword, or defining the channel path as spanned
  - A zero as the access list (null access list) and a candidate list of two or more LPs with the PART or PARTITION keyword without specifying either the REC parameter, the SHARED keyword, or defining the channel path as spanned
  - A zero as the access list (null access list) and no candidate list with the PART or PARTITION keyword without specifying either the REC parameter, the SHARED keyword, or defining the channel path as spanned.

CPATH=
specifies the ICP channel path to which the channel path being defined is connected.

The CPATH keyword is valid only for ICP channel paths (TYPE keyword) and is required for all ICP definitions. It specifies the ICP channel path that connects to the ICP channel path in the PATH keyword in the same CHPID

statement. For example, `PATH=(FE),CPATH=(FF),TYPE=ICP,...`specifies that ICP channel path FE is connected to channel path FF.

ccsid
specifies the logical channel subsystem (CSS) ID associated with this parameter. The CSS ID is a one-digit number in the range 0-n. See Table F-3 on page F-5 to determine the maximum CSS ID your CPC supports.

The CSS IDs must have been defined in the PART or PARTITION keyword on the RESOURCE statement. Specify one CSS ID associated with the connecting channel path. If the connecting channel path is spanned, only one CSS ID is specified in this parameter.

If the channel path being defined is spanned, the CSS parameter is required. If only a single CSS ID was specified in the PATH keyword and the connecting channel path is in the same CSS, the CSS parameter is optional.

chpid number
specifies a two-digit hexadecimal number for the connecting *chpid number*.

The following syntax rules apply when specifying the CPATH keyword:

- The ICP channel path specified in the CPATH keyword does not need to be defined prior to its use in CPATH but must be defined somewhere in the configuration.
- ICP channel paths cannot connect to each other if they both have candidate lists with the same, single logical partition. Note that this prevents the definition of internal coupling channels in a configuration with only one logical partition.
- An ICP channel path can connect to only one ICP channel path.
- An ICP channel path cannot connect to itself.

CHPARM=*value*
specifies a parameter for the channel path that indicates how the channel is to operate. The value is a two-digit hexadecimal number.

The CHPARM keyword replaces the OS keyword. Although the OS keyword is currently accepted, IOCP will disallow it in the future.

The CHPARM keyword identifies a channel path to be managed by dynamic CHPID management. When bit 7 of the CHPARM value is on (for example, X'01'), the channel path is managed. Only CNC, FCV, and FC channel paths (TYPE keyword) can be managed. A managed channel path cannot be spanned (PATH keyword). Managed paths require that the IOCDS be dynamic-capable (TOK keyword). A dynamic-capable IOCDS is built when using HCD on OS/390, z/OS, or VM or specifying IOCP CMS utility option DYN for VM.

The CHPARM keyword also specifies whether or not an OSD channel path is to disable priority specification. When bit 6 of the CHPARM keyword value is on (for example, X'02'), the OSD channel path has priority specification disabled and the channel supports a maximum of 1920 OSA valid subchannels (640 TCP/IP stacks). Otherwise, the OSD channel path has priority specification enabled and the channel supports a maximum of 480 OSA valid subchannels (160 TCP/IP stacks).

Disabling priority specification is supported only for OSA-Express2 features. If it is disabled for an OSA-Express feature, the I/O subsystem flags the channel path with a definition error and the channel path is unavailable until a dynamic

I/O change is made or power-on reset is performed with a new IOCDS to resolve the error. For additional information, see “OSA Configuration Considerations” on page 1-25.

The CHPARM keyword also specifies the TCP/IP maximum transmission unit (MTU) and the IQDIO frame size to use for I/O requests on IQD channel paths (TYPE keyword). Bits 0 and 1 of the CHPARM keyword value are used and support the following values for IQD channel paths:

- 00 for 8K MTU and 16K frame size
- 40 for 16K MTU and 24K frame size
- 80 for 32K MTU and 40K frame size
- C0 for 56K MTU and 64K frame size.

Any undefined value is incorrect for all channel path types.

The following table summarizes the supported CHPARM values:

Table 2-1. Supported CHPARM Values

	CHPID Type			
CHPARM Value	**CNC, FCV, FC**	**OSD**	**IQD**	**All Others**
00	Not Managed	Priority Enabled	8K MTU	N/A
01	Managed	Error	Error	Error
02	Error	Priority Disabled	Error	Error
40	Error	Error	16K MTU	Error
80	Error	Error	32K MTU	Error
C0	Error	Error	56K MTU	Error

IOCLUSTER=*name*

specifies an I/O cluster name. An I/O cluster is a sysplex that owns a managed channel path (CHPARM keyword). The I/O cluster name is a 1-8 alphanumeric (0-9, A-Z) or special (@, #, or $) character name. The maximum number of I/O cluster names is 64.

Only operating systems running in logical partitions (LPs) that belong to the specified sysplex can manage the channel path.

The IOCLUSTER keyword must be specified for every managed channel path. The IOCLUSTER keyword cannot be specified for any channel path that is not managed.

The PART, PARTITION, and NOTPART keywords cannot be specified on the CHPID statement when the IOCLUSTER keyword is specified. Also, the IOCLUSTER keyword indicates that a channel path is shared and assigns the channel path a null access list and a candidate list of all LPs defined in the configuration.

CHPID Statement Coding Examples

Example 1:

```
CHPID PATH=17,PCHID=100,TYPE=CNC,PARTITION=((LP2),(LP1,LP4),REC),SWITCH=3E
```

The preceding statement:

- Defines channel path 17 in the only CSS in the configuration for the card port associated with physical channel ID 100

- Specifies that the channel path operates as an ESCON channel
- Specifies that the channel path will be initially accessed by logical partition LP2 and that LP1 and LP4 are also authorized to access the channel path
- Defines the *chpid* as reconfigurable
- Defines the *chpid* the switch number 3E.

Example 2:

```
CHPID PATH=28,PCHID=100,TYPE=CNC,PART=((LP1,LP3),(LP2))
```

The preceding statement:

- Defines channel path 28 in the only CSS in the configuration for the card port associated with physical channel ID 100
- Specifies that the channel operates as an ESCON channel path
- Implicitly defines the channel path as shared
- Specifies that the channel path will initially be accessed by logical partitions LP1 and LP3 and that LP2 is also authorized to access the channel path.

Example 3:

```
CHPID PATH=28,PCHID=100,TYPE=CNC,NOTPART=((LP1,LP3),(LP2))
```

The preceding statement:

- Defines channel path 28 in the only CSS in the configuration for the card port associated with physical channel ID 100
- Specifies that the channel operates as an ESCON channel path
- Implicitly defines the channel path as shared
- Specifies that the channel path will initially be accessed by all logical partitions in the configuration **except** LP1, LP2, and LP3 and that all logical partitions in the configuration **except** LP2 are also authorized to access the channel path.

Example 4:

```
CHPID PATH=35,PCHID=100,TYPE=CNC,PART=((0),(LP2,LP3)),SHARED
```

The preceding statement:

- Defines channel path 35 in the only CSS in the configuration for the card port associated with physical channel ID 100
- Specifies that the channel path operates as an ESCON channel
- Defines the channel path as shared
- Specifies that the channel path will not be initially accessed by any logical partitions and that LP2 and LP3 are authorized to access the channel path.

Example 5:

```
CHPID PATH=(CSS(1),35),PCHID=100,TYPE=FC,PART=(LP1,LP2)
```

The preceding statement:

- Defines channel path 35 in CSS 1 for the card port associated with physical channel ID 100
- Specifies that the channel path operates as a FICON channel
- Implicitly defines the channel path as shared
- Specifies that the channel path will be initially accessed by logical partitions LP1 and LP2 in CSS 1. Any other logical partitions in CSS1 in the configuration will also be authorized to access the channel path.

Example 6:

```
CHPID PATH=(CSS(0,1),FF),TYPE=IQD,PART=((CSS(0),(LP1,LP2),(=)),(CSS(1),
        (LPA),(=)))
```

The preceding statement:

- Defines channel path FF in CSSs 0 and 1
- Specifies that the channel path is a HiperSocket channel
- Defines the channel path as spanned and implicitly as shared
- Specifies that the channel path can only be accessed by logical partitions LP1 and LP2 in CSS 0 and by logical partition LPA in CSS 1.

Note: See Appendix E, “Configuration Examples” for more CHPID statement coding examples.

CNTLUNIT

CNTLUNIT is an optional statement that describes the following:

- The characteristics of the control unit
- The channel paths to which the control unit is attached
- The unit addresses the control unit recognizes.

Each physical control unit in the I/O configuration must be specified in a separate CNTLUNIT statement to be used. This requirement includes control units that reside in the same physical unit as an I/O device or in another control unit.

IBM recommends that you define only one CNTLUNIT statement for each physical control unit, control unit image (defined with CUADD values), or control-unit function in your configuration. However, there are configurations that require you to use multiple CNTLUNIT statements:

- Some storage controls (for example, the IBM 3990) contain multiple control-unit functions with the number varying based on the mode of the storage control (for example, DLS or DLSE in the 3990 model 3). IBM recommends that you code a CNTLUNIT statement for each control-unit function (storage director) provided in the storage control.
- You might require multiple logical partitions (LPs) to access a single control unit, perhaps with multiple paths per LP. IBM recommends that you use shared channel paths to a single control unit definition to accomplish this. However, if this is not possible (for example, when the configuration calls for more than eight paths to a parallel control unit), you can use multiple CNTLUNIT statements to define the single control unit function. However, you must ensure that each LP does not have paths defined to more than one CNTLUNIT definition.
- If your control unit supports both ESCON and parallel interfaces, you might want to use both types of interfaces to the same LP. You should avoid this type of configuration but if you require the mixing of interfaces, you must consider the following rules:
  - You must choose between all-parallel or all-ESCON interfaces to any one LP at any one time. You can use one CNTLUNIT statement to define a control-unit image for the parallel paths and another CNTLUNIT statement to define a control-unit image for the ESCON paths. Each CNTLUNIT must be accompanied with unique IODEVICE statements.
  - When using the ESCON paths to the control unit you **must**:
    - Vary offline all devices (that is, device numbers) defined to the parallel control-unit image.

- Disable the parallel interfaces at the physical control unit.

– When using the parallel paths, you must vary offline all devices (that is, device numbers) defined to the ESCON control-unit image by doing either of the following:
  - If you have an ESCON Director, use the ESCON Manager (or the ESCON Director console) to prohibit the connection between the control unit and the system
  - If your ESCON connections are point-to-point, configure the *chpids* offline using the operating system, ESCON Manager or the CPC console.
– When you are running VM with guest operating systems, you can use multiple CNTLUNIT statements for a single physical control unit in certain environments to, in effect, dedicate the same physical devices to more than one guest. This technique involves potential path-grouping considerations that create operational complications and should only be used with caution and a knowledge of the possible consequences.

See Appendix F, “Machine Limits and Rules” for a list of machine limits and rules for your CPC. See Appendix D, “List of I/O Devices and Control Units” for a list of some control unit types and their characteristics.

Based on information in the CNTLUNIT statements, IOCP constructs control unit headers for a logical channel subsystem (CSS) to use. A control unit header is a logical representation of one to eight physical control units. A control unit header is built for each one of the following:

- Physical control unit with no I/O devices attached.
- Physical control unit that does not share any I/O devices with other physical control units.
- Groups of two or more control units that share devices between them.

A CSS uses the control unit headers for queuing I/O requests for the devices attached to the associated physical control units. One I/O request queue exists for each control unit header. A CSS adds to the same I/O request queue all I/O requests for all devices in the control unit header. (Devices in the control unit header are all the devices attached to the set of physical control units that are in the control unit header.)

IOCP also establishes a rotation order for the channel paths associated with each control unit header. When initiating I/O requests associated with the control unit header, a CSS uses this rotation order to determine the sequence for selecting channel paths. See “Rotation Order” on page 1-36 for a description of how IOCP establishes the rotation order of the channel paths.

The CNTLUNIT statement must follow any CHPID statements that specify channel paths the control unit uses. The CNTLUNIT statement must precede any IODEVICE statements that refer to the control unit.

See Appendix A, “Coding IOCP Statements” for a summary of the rules for coding statements and the notation used in this document to illustrate statements.

The format of the CNTLUNIT statement is as follows:

```
[symbol]      CNTLUNIT      CUNUMBR=number
                            PATH=((CSS(cssid),chpid[,chpid]...),...)
                            [LINK=((CSS(cssid),link address
                                 [,link address]...),...)]
                            [CUADD=address]
                            [PROTOCL={D|S|S4}]
                            SHARED={Y|N}
                            UNIT=type
                            UNITADD=((address[,number]),...)
```

CUNUMBR=*number*

specifies the hexadecimal number that is assigned to the control unit. One to four hexadecimal digits in the range of 0000-FFFE can be specified. You must assign a unique number to each control unit. The numbers can be assigned arbitrarily.

PATH=

ccsid

specifies the logical channel subsystem (CSS) IDs associated with this parameter. A CSS ID is a one-digit number in the range 0-n. See Table F-3 on page F-5 to determine the maximum CSS ID your CPC supports.

The CSS IDs must have been defined in the PART or PARTITION keyword on the RESOURCE statement. You can specify as many CSSs as you defined. If only a single CSS was defined, the CSS parameter is optional.

chpid

specifies the channel paths in each CSS that are attached to the control unit. You must specify two hexadecimal digits for each channel path identifier (*chpid*) or two asterisks (**). You cannot duplicate *chpid* numbers within a CSS.

You can specify a maximum of eight *chpids* in a CSS. However, you can specify only one channel path in a CSS for:

- An ESCON CTC control unit
- A FICON CTC control unit
- A control unit defined for OSC, OSD, OSE, OSN, FCP, or IQD channel paths (TYPE keyword).

You can specify a maximum of seven pairs of asterisks in a CSS. Each pair of asterisks specifies that a managed path (CHPARM keyword) can be added to the control unit and identifies the control unit as being managed by dynamic CHPID management. The number of pairs of asterisks specifies the number of managed paths that can be added to the control unit. The following restrictions apply to a managed control unit:

- At least one *chpid* number must be specified in each CSS
- You can specify a maximum of eight *chpids* and pairs of asterisks in a CSS
- Only CNC, FCV, and FC channel paths (TYPE keyword) can be attached to the control unit
- The channel paths attached to the control unit must be shared or spanned.

A spanned channel path is not required to attach to a control unit from each CSS to which the channel path is assigned.

The channel paths attaching to the control unit must be all unshared or all shared. You can not mix shared and unshared channel paths to a control unit. Note that spanned channel paths are also shared channel paths.

A CNC, CTC, or FC channel path (TYPE keyword) can be assigned to only one control unit unless one of the following is true:

- The channel path is assigned to an ESCON or FICON Director (SWITCH keyword)
- The control unit has a logical address (CUADD keyword).

A CFS, CFP, CBS, CBP, and ICP channel path (TYPE keyword) can be assigned to only one control unit. A CFR and CBR channel path (TYPE keyword) cannot be assigned to a control unit. CFR and CBR channel paths do not require control units or devices.

An OSC, OSE, OSN, or FCP channel path (TYPE keyword) can be assigned to only one control unit.

An IQD or OSD channel path (TYPE keyword) can be assigned to only one control unit unless the control unit has a logical address (CUADD keyword). If you need to define more than 256 devices for an IQD channel path or 254 devices for an OSD channel path, multiple control units must be defined. Specify a unique logical address for each control unit using the CUADD keyword.

All channel path types (TYPE keyword) attaching to a control unit must meet the following restrictions:

- All CBY or CVC
- All CNC, FCV, or FC
- CTC
- All CFS or CBS
- All CFP, CBP or ICP
- OSC
- OSD
- OSE
- OSN
- FCP
- IQD

IBM allows the intermixing of FC channel paths with CNC and FCV channel paths. IBM recommends that FC channel paths be mixed with CNC and FCV channel paths to ease migrating from ESCON channels to FICON channels using dynamic I/O configuration. The mixture allows you to dynamically add FC channel paths to a control unit while keeping its devices operational. A second dynamic I/O configuration change can then remove the CNC and FCV channels while keeping the devices operational.

For some types of control units and devices, there may be small operational performance differences when intermixing (for example, RMF™ usage calculations and channel path reconnection), and dynamic CHPID management cannot manage a control unit that contains intermixing. For these control units and devices, IBM recommends that the mixing of FC

channel paths with CNC and FCV channel paths be temporary and that non-dynamic I/O users avoid mixing these channel paths.

Other types of control units and devices fully support this intermixing. To determine the level to which your control units and devices support intermixing, see their device planning manuals. For those control units that do support intermixing, you should consult their performance white papers for guidance on how to best configure channels from a performance perspective. To improve the balance of workload across channels in an intermixed environment, IBM recommends that you alternate ESCON (CNC and FCV) and FICON (FC) channel paths in the control unit header for this control unit using the following patterns:

- For 6 ESCON and 2 FICON, use a sequence of E, E, E, F, E, E, E, F
- For 4 ESCON and 4 FICON, use a sequence of E, F, E, F, E, F, E, F
- For 2 ESCON and 6 FICON, use a sequence of E, F, F, F, E, F, F, F.

LINK=

ccsid
specifies the logical channel subsystem (CSS) IDs associated with this parameter. A CSS ID is a one-digit number in the range 0-n. See Table F-3 on page F-5 to determine the maximum CSS ID your CPC supports.

Each CSS ID must have been specified in the PATH keyword for this control unit. You can specify as many CSSs as you specified in the PATH keyword. If only a single CSS was specified in the PATH keyword, the CSS parameter is optional.

link address
specifies the link addresses to which the control unit is attached. The order in which the link addresses are specified for each CSS corresponds to the order in which the channel paths are specified in the CSS parameters of the PATH keyword. For example, the second link address identified for CSS 1 in the LINK keyword corresponds to the second channel path identified for CSS 1 in the PATH keyword.

The LINK keyword is optional if none of the channel paths in the PATH keyword attach to an ESCON or FICON Director (SWITCH keyword). You do not need to specify link addresses for a CSS if none of the channel paths specified for the same CSS ID in the PATH keyword attach to an ESCON or FICON Director. Link addresses that correspond to channel paths not attaching to a director can be specified as two or four asterisks (** or ****) or, for ESCON channel paths, any valid link address value.

FC channel paths not attaching to a director can specify only link addresses of asterisks. A link address of asterisks must be specified for each channel path in the PATH keyword that is specified as two asterisks (**). This pairing of asterisks in the PATH and LINK keywords of the CNTLUNIT statement indicates the number of managed paths (CHPARM keyword) that can be added to the control unit.

Link addresses must be specified with two or four hexadecimal digits. The valid link address range is 01-FE for CBY, CVC, CNC, CTC, and FCV channel paths (TYPE keyword). The valid link address range is 0000-FFFF for an FC channel path. To determine whether a two-digit or four-digit link address should be specified for an FC channel path and how to select a four-digit link address, see “Defining FICON Switch Configurations” on page 1-30. Note that when you specify a four-digit link address for an FC channel path, every link address for that channel path must also be four digits.

If the LINK keyword is specified for a CSS, either a valid link address or asterisks must be specified for every channel path in the same CSS in the PATH keyword. If the LINK keyword is not specified or if asterisks are specified, IOCP assumes that the link address is arbitrary and IOCP assigns a link address of 0D. Link addresses specified in the LINK keyword for dynamic connections through a director must equal the link addresses associated with the physical ports on the director to which the control unit is attached. However, link addresses specified for channel paths having dedicated connections through an ESCON Director can be arbitrary.

For channel paths having dedicated connections through an ESCON Director, it is recommended that you specify the corresponding link address on the CNTLUNIT statement as the link address associated with the physical port on the ESCON Director to which the control unit is attached. If a CTC channel path does not attach to an ESCON Director or has a dedicated connection through an ESCON Director, the link address specified here may not be the link address the CSS uses.

For maximum availability of a control unit and its devices, see Appendix D, “List of I/O Devices and Control Units” for recommendations for selecting the physical ports on an ESCON Director to attach to the control unit.

The LINK keyword is valid only for CBY, CVC, CNC, CTC, FCV, and FC channel paths (TYPE keyword).

Even though you can specify multiple link addresses for CBY and CVC channel paths (TYPE keyword), the I/O subsystem does not support dynamic connections through an ESCON Director for CBY or CVC channel paths. A CBY or CVC channel path that attaches to an ESCON Director can have only a dedicated connection through it. Therefore, you can connect only one link address on an ESCON Director to a CBY or CVC channel path at a time.

Note: If no link address is specified for a channel path that does not attach to a director, IOCP selects a link address of 0D to address the control units on the channel path. The I/O Problem Determination (IOPD) frame and IOCDS display frames on the support element (SE) display this arbitrary link address. However, the IOCP reports show that no link address was specified on its CNTLUNIT statements.

The I/O subsystem flags a channel path with a definition error in the following situations:

- The channel path does not attach to an ESCON or FICON Director or has a dedicated connection through an ESCON Director and has more than 1 link address specified on its CNTLUNIT statements.
- The channel path has a dynamic connection through a director and no link address was specified on the CNTLUNIT statement.
- The channel path has four-digit link addresses but is not connected to a high integrity fabric of FICON switches. For more information on high integrity fabrics, see “Defining FICON Switch Configurations” on page 1-30.

In these three instances, the channel path is unavailable and remains so until the error is resolved.

In addition to the preceding syntax rules, the following configuration rules also apply when specifying link addresses. For link addresses with four

digits, rules are enforced against the switch to which the channel path is connected (that is, the entry switch) and not the switch to which the control unit is attached. When a four-digit link address is specified for a channel path, IBM recommends that you specify four-digit link addresses for all paths that have the same entry switch. Otherwise, IOCP cannot enforce some of the following switch configuration rules.

- Specifying more than one link address for an ESCON channel path is not allowed unless the channel path is connected to an ESCON Director. Specifying any link address other than asterisks for an FC channel path is not allowed unless the channel path is connected to a FICON Director.
- All channel path types (TYPE keyword) assigned to a link address on an ESCON Director must be identical except for CBY and CVC channel paths and CNC and FCV channel paths. Only CBY or CVC and CNC or FCV channel paths can be assigned to the same link address on an ESCON Director.
- Specification of any given path (*pchid.link*) on more than one control unit is not allowed unless one of the following is true:
  - The control units attach to CBY or CVC channel paths (TYPE keyword).
  - The control units have unique logical addresses (CUADD keyword). See "Example 6" on page 2-40 for CNTLUNIT definition considerations.
- The specification of FICON CTC and non-FICON CTC control units (see "IOCP Definitions" on page 2-5) to the same link address on the same director is not allowed. The control units must either all specify UNIT=FCTC or none of them can specify FCTC.
- The specification of multiple control units to the same link address on the same director is not allowed unless one of the following conditions is true:
  - The control units attach to CBY or CVC channel paths (TYPE keyword).
  - The control units are ESCON CTC or FICON CTC control units (see "IOCP Definitions" on page 2-5), and the path (*pchid.link.cuadd*) attaching to each control unit is unique. That is, the *pchid*, link address, or logical address (CUADD keyword) for the control unit must be different on each control unit.
  - The control units have the same unit address ranges and none of the paths attaching to the different control units belongs to the same logical partition. The logical partition intersection test is based on the initial access lists of the channel paths attaching to the control units.
  - Unique logical addresses (CUADD keyword) were specified on all the CNTLUNIT statements.

FC Control Unit Definition Considerations: FC channel paths (TYPE keyword) support a maximum number of unit address ranges and unit addresses (see Table F-2 on page F-3). IOCP calculates the number of unit address ranges and unit addresses for a spanned FC channel path (PATH keyword in the CHPID statement) as follows:

- If a single link address is used for the channel path in each CSS of a control unit, one unit address range is counted and the number of unit addresses specified with the UNITADD keyword on the CNTLUNIT statement are counted once.

- If different link addresses are used for the channel path in any of the CSSs of a control unit, one unit address range is counted for each unique link address and the number of unit addresses specified with the UNITADD keyword on the CNTLUNIT statement are counted once for each unique link address.

For example, CHPID 10 is an FC channel path that is spanned to CSSs 0, 1, 2, and 3. It is assigned to a control unit in CSSs 0, 1, and 3 with link addresses C0, C0, and D0 respectively. Because there are a total of 2 unique link addresses, 2 unit address ranges are counted. If the UNITADD keyword specified 128 unit addresses, a total of 256 unit addresses are counted.

CUADD=*address*
specifies the logical address for the control unit.

For example, the IBM Enterprise Storage Server® (ESS) 2105 control unit requires that the logical address specified with the CUADD keyword matches the control unit image address associated with the corresponding control unit logical subsystem (LSS).

Note: Not all ESCON and FICON control units support logical addressing.

The address is one-to-two hexadecimal digits in the range 0-F for CNC, CTC, and FCV channel paths and in the range 00-FF for FC, IQD, and OSD channels paths. However, if FC channel paths are mixed with CNC or FCV channel paths, the address must be in the range 0-F. The address allows you to specify a CNC, CTC, FCV, or FC channel path on multiple CNTLUNIT statements for a given path (*pchid.link* or *switch.link*) or to specify an IQD or OSD channel path on multiple CNTLUNIT statements.

- For CNC, CTC, and FCV channel paths, this allows as many as 16 CNTLUNIT statements to specify the same *pchid* or the same link address for a *pchid* on an ESCON Director.
- For FC channel paths, this allows as many as 256 CNTLUNIT statements to specify the same *pchid* or the same link address for a *pchid* on a FICON Director.
- For an IQD channel path, this allows up to the maximum of 64 CNTLUNIT statements to be specified.
- For an OSD channel path, this allows up to the maximum of 16 CNTLUNIT statements to be specified. The OSAD device with unit address FE requires a control unit definition with a CUADD keyword value of zero or no CUADD keyword. Otherwise, the device is unusable.

Note: A CNC or CTC channel path not assigned to an ESCON Director is viewed as having a single link address.

The CUADD keyword is valid only for: CNC, CTC, FCV, FC, IQD, and OSD channel paths (TYPE keyword).

For a channel path assigned to an ESCON CTC or FICON CTC control unit, the logical address identifies the logical partition to which this channel path is to communicate. If the remote channel path to which this channel path is to communicate is not shared, then the logical address must be zero or not specified. If the remote channel path to which this channel path is to communicate is shared, then the logical address must equal the desired MIF

image ID[1] from the RESOURCE statement for the logical partition that the shared channel path can access. This applies to CNC, CTC, FCV, and FC remote channel paths that are shared.

However, if the remote channel path is a shared FC channel path on a CPC that supports multiple logical channel subsystems (that is, if the IOCP described in this document supports the CPC), then the logical address must equal the combination of the desired CSS ID and the MIF image ID for the logical partition with which you want to communicate. For example, if the remote channel path is shared within CSS 1 and you want to communicate with the logical partition that has MIF image ID 5, specify CUADD=15.

ESCON CTC and FICON CTC communications are on a logical partition basis even if a channel path is shared by multiple logical partitions. You must define a control unit for every logical partition to which you wish to communicate.

Note: The preceding CTC requirements for the CUADD keyword apply to any type of remote CPC (for example, a 9672 CPC).

For more information on ESCON CTC and FICON CTC communication, see *ESCON and FICON Channel-to-Channel Reference*, SB10-7034.

In addition to the above syntax rules, the following configuration rules also apply when specifying the CUADD keyword:

- All CUADD values must be unique for a given path (*pchid.link*) regardless of whether or not a director was specified. That is, the combination *pchid.link.cuadd* is allowed only once in the configuration. See “Example 6” on page 2-40 for CNTLUNIT definition considerations.
- For an IQD or OSD channel path, you cannot duplicate CUADD values. Every control unit on the channel path must specify a unique CUADD value.
- If the CUADD keyword is specified, the CUADD keyword must also be specified on all other CNTLUNIT statements that have at least one path in common (same *switch.link* or *pchid.link*).
- If a channel path does not attach to a director (SWITCH keyword), the specification of FICON CTC and non-FICON CTC control units on the same channel path is not allowed. See “IOCP Definitions” on page 2-5. The control units must either all specify UNIT=FCTC or none of them can specify FCTC.
- All CUADD values must be unique for a given path through a director (*switch.link*) unless the following conditions are true:
  - The control units are ESCON CTC or FICON CTC control units (see “IOCP Definitions” on page 2-5) and the channel paths for each control unit are all the same type or a mix of CNC and FCV.
  - The control units have the same unit address ranges, the channel paths in each control unit are all the same type or a mix of CNC and FCV, and none of the paths attaching to the different control units belongs to the same logical partition. The logical partition intersection test is based on the initial access lists of the channel paths attaching to the control units.

Otherwise, the combination *switch.link.cuadd* is allowed only once in the configuration.

1. For IOCP programs not described by this document, the MIF image ID was called a partition number.

PROTOCL=

specifies the interface protocol that the parallel control unit uses when operating with the channel paths specified in the PATH parameter. The PROTOCL keyword is meaningful only for CVC channel paths (TYPE keyword). IOCP ignores the PROTOCL keyword for all other channel path types. IOCP assigns PROTOCL=D to control units attached to CBY channel paths.

Note: Incorrect specification of the PROTOCL parameter may produce unpredictable results. For example, if you specify PROTOCL=S (data streaming) for a control unit that supports the DC interlock protocol, I/O requests can result in detected errors (such as data overruns or interface control checks) or in undetected errors. Additionally, specifying PROTOCL=S for a control unit that runs at a maximum data rate of 4.5MB per second could cause bus parity checks.

D specifies the direct-coupled interlock (DC interlock) protocol. This protocol is the standard I/O interface that requires a response to a demand. If you do not code PROTOCL, D is the default.

S specifies data streaming protocol at a maximum data rate of 3.0 megabytes per second. This protocol does not require the demand response but continues at the rate governed by the control unit.

S4

specifies data streaming protocol at a maximum data rate of 4.5 megabytes per second. This protocol does not require the demand response but continues at the rate governed by the control unit.

SHARED=

specifies the level of concurrency of I/O requests that the parallel channel path allows for the control unit. IOCP automatically sets the control unit type (1 or 2) based on the SHARED parameter that you specify. See Appendix D, “List of I/O Devices and Control Units” for more information on specifying the SHARED parameter. (For further information on control unit types, see “Control Unit Types” on page 1-37)

The SHARED keyword is meaningful only for CVC channel paths (TYPE keyword). IOCP ignores the SHARED keyword for all other channel path types. Control units that attach to CBY, CNC, CTC, OSC, OSD, OSE, OSN, FCV, FC, FCP, or IQD channel paths are type 2. Control units that attach to CFS, CFP, CBS, CBP, and ICP channel paths are type 1.

Y specifies that the control unit supports:

- Only one I/O request at a time, regardless of the number of I/O devices attached (for example, the 3803 Tape Control Unit for magnetic tape units or the 3258, 3272, or 3274 Control Unit)
- Disconnect command chaining (DCC) operations.

IOCP assigns the control unit as type 1.

The channel ensures that only one I/O request is processed at a time for all devices sharing the control unit. If sense information is pending in the control unit for an I/O device attached to the control unit, the channel ensures that I/O requests for other I/O devices attached to the control unit are not initiated until the system control program has issued an I/O request to clear the pending sense information.

N specifies that the control unit supports multiple I/O requests concurrently (one for each attached I/O device). IOCP assigns the control unit as type 2.

UNIT=*type*

specifies the type of control unit. You can specify as many as eight alphanumeric or special (-, #, @, or $) characters that identify the type of control unit. IOCP checks the syntax for alphanumeric or special characters.

IOCP takes special actions for control unit types SCTC and FCTC. See the LINK and CUADD keyword sections for the CNTLUNIT statement. Also, control unit type FCTC is valid only for FC channel paths (TYPE keyword).

You must specify a type for every control unit in your I/O configuration.

Notes:

1. To define a FICON channel-to-channel (CTC) connection between FC channel paths (TYPE keyword), specify UNIT=FCTC for each CTC control unit defined on the FC channel path.
2. For integrated control unit/devices (such as the IBM 3800 Page Printer), you can specify the same type value in the UNIT parameter of the CNTLUNIT statement as in the UNIT parameter of the of IODEVICE statement. For example, for the IBM 3800 Page Printer, you can specify UNIT=3800 in each of the two statements.

UNITADD=

address

specifies the unit addresses of the I/O devices that the control unit recognizes. You specify two hexadecimal digits in the range of 00-FF. For example, UNITADD=((0A),(0B),(0F)) specifies that the control unit recognizes unit addresses 0A, 0B, and 0F. At least one unit address must be specified. A unit address need not represent an attached device.

number

specifies the number of sequential unit addresses the control unit recognizes. You specify a one-, two-, or three-digit decimal value in the range of 1-256. For example, UNITADD=((0A,3)) specifies that the control unit recognizes unit addresses 0A, 0B, and 0C. The unit address plus the number of addresses must not exceed a hexadecimal address of FF. If the number is omitted, a value of 1 is assumed.

You can specify a maximum of eight addresses or sets of address and number values for parallel control units. For ESCON and FICON control units, you can specify only one range of unit addresses. The unit addresses specified for the CNTLUNIT statement must include the unit addresses of the attached devices. The unit address of a device is taken from the UNITADD parameter of the IODEVICE statement if specified, or from the rightmost two digits of the device number specified with the ADDRESS parameter of the IODEVICE statement.

Note: See Appendix D, “List of I/O Devices and Control Units” for some exceptions and recommendations that apply to specific device types. Some ESCON and FICON control units require that the unit address range begin with hexadecimal 00.

IOCP ignores the UNITADD keyword for control units attached to CFS, CFP, CBS, CBP, ICP, OSC, OSD, OSE, OSN, FCP, or IQD channel paths. IOCP defines unit addresses 00-FE for control units attached to OSD, OSE, or OSN channel paths. IOCP defines unit addresses 00-FD for control units attached to FCP or OSC channel paths. IOCP defines unit addresses 00-FF for control units attached to IQD channel paths.

The full range of unit addresses that the control unit can address must be specified regardless of whether devices are attached. If you do not specify one or more of the unit addresses that the control unit can address, missing interruption handler (MIH) situations result. However, this does not apply to ESCON CTC or FICON CTC control units.

Notes:

1. You must specify identical unit addresses in the CNTLUNIT statements for TYPE=CTC and TYPE=CNC or TYPE=FCV channel paths that are to communicate with each other. You must also specify identical unit addresses for FICON CTC control units that are to communicate with each other.
2. Unit addresses must be unique for each *chpid* on parallel control units. Two control units attached to the same parallel channel path must have unique unit address ranges.
3. Unit addresses must be unique for each control unit (not for each *chpid*) for ESCON, FICON, OSD, and IQD devices. Two devices attached to the same ESCON, FICON, OSD, or IQD control unit cannot have the same unit address. However, two devices attached to the same CNC, CTC, FCV, FC, OSD, or IQD channel path (TYPE keyword) can have the same unit address if they attach to different control units.

A shared CTC channel path (SHARED keyword specified in the CHPID statement) can generate more unit addresses and unit address ranges than an unshared channel path. See “Shared ESCON CTC Considerations” on page 1-17.

A spanned FC channel path (PATH keyword in the CHPID statement) can generate more unit addresses and unit address ranges than an unspanned channel path. See FC Control Unit Definition Considerations on page 2-34.

CNTLUNIT Statement Coding Examples

Example 1:

```
CU10A CNTLUNIT CUNUMBR=10A,PATH=06,SHARED=N,           X
               UNIT=3800,UNITADD=((0A,3)),PROTOCL=S
```

The preceding statement:

- Assigns the control unit number of 10A to an IBM 3800 Page Printer.
- Names channel path 06 to which the printing subsystem is attached. The CSS parameter was not specified for the PATH keyword because there is only one CSS in the configuration.
- Specifies the 3.0 MB data-streaming protocol.
- Defines unit addresses 0A-0C to the control unit.

Example 2:

```
CU180 CNTLUNIT CUNUMBR=180,PATH=05,PROTOCL=S4,          X
               SHARED=N,UNIT=3490,UNITADD=((80,16))
```

The preceding statement:

- Assigns the control unit number of 180 to an IBM 3490 Magnetic Tape Subsystem.
- Names channel path 05 to which the control unit is attached. The CSS parameter was not specified for the PATH keyword because there is only one CSS in the configuration.

- Specifies the 4.5MB data-streaming protocol.
- Defines unit addresses 80-8F to the control unit.

Example 3:

```
CU11A CNTLUNIT CUNUMBR=11A,PATH=(06,07),LINK=(E0,E1)    X
               UNIT=3990,CUADD=1,UNITADD=((00,16))
```

The preceding statement:

- Assigns the control unit number of 11A to an IBM 3990 Storage Control.
- Names two channel paths (06 and 07) to which the control unit is attached (where these paths are defined as TYPE=CNC and are assigned to an ESCON Director in the CHPID statement associated with this CNTLUNIT statement). The CSS parameter was not specified for the PATH keyword because there is only one CSS in the configuration.
- Assigns link address E0 to channel path 06 and link address E1 to channel path 07.
- Defines logical address 1.
- Defines unit addresses 00-0F to the control unit.

Example 4:

```
CU987 CNTLUNIT CUNUMBR=987,PATH=3F,LINK=F0,             X
               UNIT=SCTC,UNITADD=((40,16))
```

The preceding statement:

- Assigns 987 as the control unit number for an ESCON CTC control unit.
- Assigns the control unit to channel path 3F in the only CSS in the configuration (where the path was defined as TYPE=CTC and assigned to an ESCON Director in the CHPID statement associated with this CNTLUNIT statement).
- Assigns link address F0 to the channel path.
- Defines unit addresses 40-4F to the control unit.

Example 5:

```
CNTLUNIT CUNUMBR=290,PATH=((CSS(0),34,79),(CSS(1),80)),     X
              LINK=((CSS(0),FE,FE),(CSS(1),FE)),UNIT=SWCH,  X
              UNITADD=00
```

The preceding statement:

- Assigns control unit number 290 to an ESCON Director Model 1.
- Assigns the control unit to channel paths 34 and 79 in CSS 0 and channel path 80 in CSS 1 (where these paths are defined as TYPE=CNC in the CHPID statement associated with this CNTLUNIT statement).
- Assigns link address FE to all three channel paths.
- Defines unit address 00 to the control unit.

Example 6:

```
CHPID PCHID=100,PATH=(CSS(0,1),40),TYPE=FC,SWITCH=25

CNTLUNIT CUNUMBR=280,UNIT=2105,UNITADD=((00,256)),CUADD=01,          X
              PATH=((CSS(0),40),(CSS(1),40)),                        X
              LINK=((CSS(0),D0),(CSS(1),D0))
```

The preceding statement:

- Define a spanned FC channel path.

- Assigns 280 as the control unit number of the IBM 2105 Enterprise Storage Server.
- Defines unit addresses 00-FF for the logical control unit.
- Defines logical address 01 for the logical control unit.
- Assigns the control unit to channel path 40 in CSSs 0 and 1.
- Assigns the same link address D0 to channel path 40 in both CSSs.

When configuring a spanned channel path to use the same link address in its CSSs for the same control unit logical address (CUADD), you must define a single control unit containing all of the CSSs for the channel path. You cannot define separate control units for each CSS for the channel path because this would violate the rule that the path combination *pchid.link.cuadd* can only occur once in the configuration. For example, control unit 280 above could not be defined as follows:

```
CNTLUNIT CUNUMBR=280,UNIT=2105,UNITADD=((00,256)),CUADD=01,          X
              PATH=((CSS(0),40)),LINK=((CSS(0),D0))
CNTLUNIT CUNUMBR=281,UNIT=2105,UNITADD=((00,256)),CUADD=01,          X
              PATH=((CSS(1),40)),LINK=((CSS(1),D0))
```

See Appendix E, “Configuration Examples” for more CNTLUNIT statement coding examples.

IODEVICE

IODEVICE is an optional statement that describes the following:

- The I/O device number
- The device characteristics
- The control units to which the device is assigned.

Each uniquely addressable I/O device in your I/O configuration must be specified in an IODEVICE statement to use for I/O requests.

See Appendix D, “List of I/O Devices and Control Units” for a list of some I/O device types and their characteristics.

For VM

VM does not necessarily support devices that IOCP supports. For a list of supported devices, see the *General Information Manual* for the VM operating system that you use.

For VSE

VSE does not necessarily support devices that IOCP supports. For a list of supported devices, see *System Control Statements* for the VSE operating system that you use.

See Appendix F, “Machine Limits and Rules” for a list of machine limits and rules for your CPC.

The IODEVICE statement must follow any CNTLUNIT statements that specify the control units the device uses.

See Appendix A, “Coding IOCP Statements” for a summary of the rules for coding statements and the notation used in this document to illustrate statements.

The format of the IODEVICE statement is as follows:

```
[symbol] IODEVICE ADDRESS=(number[,count])
                  CUNUMBR=(number[,number]...)
                  [MODEL=model]
                  [{PART | PARTITION | NOTPART}=
                       ((CSS(cssid),{name|0}[,name]...),...)]
                  [PATH=((CSS(cssid),chpid),...)]
                  [SCHSET={ssid|((CSS(cssid),ssid),...)}]
                  [STADET={Y|N}]
                  [TIMEOUT={Y|N}]
                  UNIT=device
                  [UNITADD=address]
```

ADDRESS=

number
specifies the device number. Specify a 1-4 digit hexadecimal number in the range 0000-FFFF.

For z/OS
Though z/OS supports the definition and use of devices with 4-digit device numbers, not all products, subsystems, or applications that run under z/OS can use these devices. See the *MVS/ESA SP 5.1 Conversion Notebook*, GC28-1436, for more information.

For VSE
The address range for VSE is 0000-0FFF.

If you do not specify the UNITADD keyword in the IODEVICE statement, the last two hexadecimal digits in the device number specify the unit address that is transmitted on the channel path to select the device. These two hexadecimal digits must match one of the unit addresses specified in the UNITADD parameter of the CNTLUNIT statement that defines the control units to which the device is attached.

If you specify the UNITADD parameter in the IODEVICE statement, the last two digits in the device number can be any value that follows the rules in Appendix D, “List of I/O Devices and Control Units” and makes the device number unique.

count
specifies the number of sequential device numbers to be assigned to the devices. You specify a one-, two-, or three-digit decimal value in the range of 1-256. (For example, ADDRESS=(10A,3) specifies that the device numbers of 10A, 10B, and 10C are assigned.)

The unit address for a device defaults to the last two digits in the device number parameter of the ADDRESS keyword unless the UNITADD keyword

is specified. The unit address plus the number of addresses specified in the count parameter of the ADDRESS keyword, minus 1, must not be larger than a hexadecimal value of FF.

The device number specified in the ADDRESS keyword plus the number of devices specified in the count parameter of the ADDRESS keyword, minus 1, must not be larger than a hexadecimal value of FFFF.

The specified device numbers are defined in the appropriate subchannel set (SCHSET keyword) in each CSS to which the attached control units are assigned.

OSD, OSN, FCP, and IQD channel paths support a maximum number of valid subchannels. Valid subchannels are devices that are defined to a logical partition and permitted for use by the logical partition. Valid subchannels are calculated as follows:

- For unshared channel paths, each device defined in IOCP represents a single valid subchannel.
- For shared channel paths, each device defined in IOCP represents multiple valid subchannels based on the total number of logical partitions (LPs) in its device candidate list.

A maximum of 480 OSA valid subchannels (160 TCP/IP stacks) can be defined on an OSD channel path. A maximum of 1920 OSA valid subchannels (640 TCP/IP stacks) can be defined on an OSD channel path on an OSA-Express2 feature when priority specification is disabled (for example, CHPARM=02 is specified on CHPID statement). An OSA subchannel is a device with a unit address in the range 00-FD. The OSAD device with unit address FE is excluded from the maximum.

A maximum of 480 OSN valid subchannels and 180 3745 valid subchannels can be defined on an OSN channel path. OSN subchannels are defined with UNIT=OSN on the IODEVICE statement, and 3745 subchannels are defined with UNIT=3745. Valid subchannels are devices with unit addresses in the range 00-FD. The OSAD device with unit address FE is excluded from the maximums.

A maximum of 480 valid subchannels can be defined on an FCP channel path.

A maximum of 12288 valid subchannels can be defined on all IQD channel paths in the configuration. The maximum applies to the valid subchannels for all IQD channel paths.

Multiple I/O devices with the same device number can be defined as long as device numbers are not duplicated within the same logical partition and the same subchannel set. IOCP determines whether devices in the same subchannel set with duplicate device numbers belong to the same logical partition by testing the initial access lists of the *chpids* assigned to the devices along with the device candidate lists (PARTITION or NOTPART keyword in the IODEVICE statement). A duplicate device number error occurs if an initial access list of a *chpid* assigned to each device includes the same logical partition and the device candidate lists of each device also include the same logical partition and the devices are in the same subchannel set.

Note: See Appendix D, “List of I/O Devices and Control Units” for some exceptions and recommendations that apply to specific device types.

OSD Device Definition Considerations: For information on how to configure OSD devices, see "OSA Configuration Considerations" on page 1-25.

For VM

The ADDRESS keyword of the IODEVICE statement in the IOCP input file has values derived from the RDEVICE statement in the SYSTEM CONFIG file, if used. For example, this RDEVICE statement is in the SYSTEM CONFIG file:

```
RDEVICE 190-193 ...
```

The corresponding IODEVICE statement is:

```
IODEVICE ADDRESS=(190,4),...
```

For VSE

The ADDRESS keyword of the IODEVICE statement in the IOCP input file has values derived from the ADD statement in the ASI Procedure file. For example, this ADD statement is in the ASI Procedure file:

```
ADD 0C0:0DF,...
```

The corresponding IODEVICE statement is:

```
IODEVICE ADDRESS=(0C0,32),...
```

CUNUMBR=*number*

specifies the control unit numbers assigned to the control units (specified in the CUNUMBR parameter of the CNTLUNIT statement) to which the device is attached. You can specify one to four hexadecimal digits in the range 0000-FFFE for each control unit.

The device is defined in each CSS to which the specified control units are assigned.

A device can be assigned to a maximum of eight control units and eight paths in a CSS with the following exceptions:

- A device assigned to an ESCON CTC or FICON CTC control unit can be assigned to only one control unit and one path in a CSS.
- A device assigned to CFS, CFP, CBS, CBP, and ICP channel paths can be assigned to only one control unit.
- A device assigned to an OSC, OSD, OSE, OSN, FCP, or IQD channel path can be assigned to only one control unit and one path in a CSS.

When the device is attached to more than one control unit (for example, by means of a string switch), each control unit must be specified.

If a device is attached to more than one control unit, all control units that attach to the device must:

- Use the same unit address to access the device
- Have the same SHARED characteristic: Y or N
- Have the same PROTOCL characteristic: D, S, or S4
- Not be attached to the same channel path in a CSS
- Attach to all shared channel paths or all unshared channel paths.

All channel path types (TYPE keyword) assigned to a device must meet the following restrictions:

- All CBY or CVC
- All CNC, FCV, or FC
- CTC
- All CFS or CBS
- All CFP, CBP, or ICP
- OSC
- OSD
- OSE
- OSN
- FCP
- IQD

IBM allows the intermixing of FC channel paths with CNC and FCV channel paths. IBM recommends that FC channel paths be mixed with CNC and FCV channel paths to ease migrating from ESCON channels to FICON channels using dynamic I/O configuration. The mixture allows you to dynamically add FC channel paths to a control unit while keeping its devices operational. A second dynamic I/O configuration change can then remove the CNC and FCV channels while keeping the devices operational.

For some types of control units and devices, there may be small operational performance differences when intermixing (for example, RMF usage calculations and channel path reconnection), and dynamic CHPID management cannot manage a control unit that contains intermixing. For these control units and devices, IBM recommends that the mixing of FC channel paths with CNC and FCV channel paths be temporary and that non-dynamic I/O users avoid mixing these channel paths. Other types of control units and devices fully support this intermixing. To determine the level to which your control units and devices support intermixing, see their device planning manuals. For those control units that do support intermixing, you should consult their performance white papers for guidance on how to best configure channels from a performance perspective.

To improve the balance of workload across channels in an intermixed environment, IBM recommends that you alternate ESCON (CNC and FCV) and FICON (FC) channel paths in the control unit header for this device using the following patterns:

- For 6 ESCON and 2 FICON, use a sequence of E, E, E, F, E, E, E, F
- For 4 ESCON and 4 FICON, use a sequence of E, F, E, F, E, F, E, F
- For 2 ESCON and 6 FICON, use a sequence of E, F, F, F, E, F, F, F.

For VM

To code the control unit number for a device, you must find the correct CNTLUNIT statement. You must know the following about the hardware I/O configuration:

- The channel path to which the device and its control unit are attached
- How the control unit recognizes the device, that is, by which unit address

Find the CNTLUNIT statement that has both of the following:

- A channel path that matches the channel path to which the device and control unit are attached
- A unit address that matches the unit address by which the control unit recognizes the device.

Use the value coded for the CUNUMBR parameter in the CNTLUNIT statement for the control unit number in the IODEVICE statement.

For example, eight 3380 Direct Access Storage units and their control unit are attached to *chpid* 07. The control unit recognizes the direct access storage units as attached at unit addresses 40-47.

However, the RDEVICE statement for this group of direct access storage units could be:

```
RDEVICE 350-357 TYPE 3380
```

The device numbers for these disk storage units range from 350-357.

The CHPID statement coded for this channel path is:

```
CHPID PATH=(07),...
```

The *chpid* is 07. The physical unit addresses of these devices are 40-47. The CNTLUNIT statement that has channel path 07 and unit addresses ranging from 40-47 is:

```
CNTLUNIT CUNUMBR=032,PATH=(07),...,UNITADD=((40,8))
```

The CUNUMBR parameter in the IODEVICE statement should be 032:

```
IODEVICE ADDRESS=(350,8),CUNUMBR=032,...,UNIT=3380,UNITADD=40
```

(The UNITADD parameter in the IODEVICE statement has the same number of unit addresses (eight) as the number specified in the ADDRESS parameter.)

This example uses the UNITADD parameter, which allows you to define device numbers (350-357) that do not contain their physical unit addresses (40-47).

MODEL=*model*

specifies the model number, if any, for the device. You can specify a maximum of four alphanumeric or special characters (#, @, or $) that represent the model number of the device. IOCP checks only the syntax for alphanumeric or special characters. IOCP does not validate the model value.

For VM

The MODEL=*model* parameter of the IODEVICE statement in the IOCP input file has the same value as the MODEL=*model* parameter of the RDEVICE statement in the SYSTEM CONFIG file.

For example, the following RDEVICE statement is in the SYSTEM CONFIG file:

```
RDEVICE ... MODEL 11
```

The corresponding IODEVICE statement is:

```
IODEVICE ...,MODEL=11,...
```

PART | PARTITION=
NOTPART=

specifies the device candidate list that identifies the logical partitions (LPs) in a CSS that can access the device. An LP **cannot** access a device if the LP is not specified in the device candidate list for the device, even if the LP can access a channel path assigned to the device.

The PART or PARTITION keyword specifies the LPs that are in the device candidate list. The NOTPART keyword specifies the LPs that are **not** in the device candidate list. For example, if a CSS has three LPs (LP1, LP2, and LP3) and you specify `NOTPART=(LP2)`, LP1 and LP3 can access the device, and LP2 **cannot**.

ccsid
: specifies the logical channel subsystem (CSS) ID associated with this parameter. The CSS ID is a one-digit number in the range 0-n. See Table F-3 on page F-5 to determine the maximum CSS ID your CPC supports.

  Each CSS ID must be associated with a control unit attached to this device. You can specify as many CSSs as the attached control units have. If all the attached control units are associated with the same, single CSS ID, the CSS parameter is optional.

name
: specifies the name of a logical partition (LP) in a CSS that can access the channel path. The LP name is a 1-8 alphanumeric (0-9, A-Z) character name that must have a non-numeric first character.

0
: specifies that no LPs in the CSS can access the device. A zero indicates a null device candidate list. The device is excluded from the specified CSS and cannot be accessed by any LP in the CSS. A zero cannot be specified in the NOTPART keyword.

| **OSC, OSD, OSE, and OSN Device Definition Considerations:** For
| information on how to configure OSC, OSD, OSE, and OSN devices, see “OSA Configuration Considerations” on page 1-25.

IQD Device Definition Considerations: For information on how to configure IQD devices, see “Internal Queued Direct Communication (HiperSockets) Support” on page 1-27.

FCP Device Definition Considerations: For information on how to configure FCP devices, see “Fibre Channel Protocol Support” on page 1-28.

Device Candidate List Specification Rules: The following rules apply when specifying the device candidate list:

- You **cannot** specify a device candidate list using both the NOTPART keyword and either the PART or the PARTITION keyword for the same CSS ID in the same IODEVICE statement.
- You can specify a device candidate list only for shared CNC, CTC, OSC, OSD, OSE, OSN, FCV, FC, FCP, or IQD channel paths. You **cannot** specify a device candidate list for unshared channel paths or CFS, CFP, CBS, CBP, and ICP channel paths.
- Device candidate list specification is optional.
- If you do **not** specify a device candidate list for a CSS to which the device is assigned:
  - Devices assigned to a shared CTC, OSD, OSN, FCP, or IQD channel path have a default device candidate list equal to the candidate list for the channel path. This excludes reserved LPs (*). The LPs in the CTC, OSD, OSN, FCP, or IQD channel path candidate list will be the only LPs in the default device candidate list.
  - Devices assigned to all other shared channel paths types have a default device candidate list equal to all LPs in each CSS with access to the device. This includes reserved LPs (*).
- If you specify a device candidate list for a CSS, it excludes any reserved LPs (*) in the CSS.
- You can specify all LP names in a CSS in the NOTPART keyword so that no LPs in the CSS can access the device. This is a null device candidate list and is equivalent to specifying a zero in the PART or PARTITION keyword.
- You **cannot** specify null device candidate lists for every CSS to which the device has access. This is equivalent to not defining the device.
- You **cannot** specify null device candidate lists for every CSS to which one of the device's control units have access. This would exclude the control unit from accessing the device. Instead, simply omit the control unit from the CUNUMBR keyword for the device.
- You **cannot** specify null device candidate lists so that every device assigned to a control unit excludes the same CSS. The result of this would be that the channel paths in the excluded CSS of the control unit would not be able to access the control unit and any of its devices. Instead, simply omit the CSS from the PATH keyword for the control unit.
- If you specify a zero for a null device candidate list in a CSS, you cannot specify a logical partition name for the same CSS.
- You **cannot** specify an LP in the device candidate list that is not defined in the RESOURCE statement.
- You can specify as many LPs as your CPC supports. See Appendix F, "Machine Limits and Rules."
- You can specify any LP in the configuration in the device candidate list as long as at least one of the LPs specified matches an LP in the channel path candidate lists for the channel paths assigned to the device. When building an IOCDS, IOCP sends a caution message identifying every LP in the device candidate list that cannot access the device. Following power-on reset, the only way for an LP that has no access to the device to gain access is through a dynamic I/O configuration change that does one of the following:
  - Modifies the channel path candidate lists of the channel paths assigned to the device
  - Modifies the device candidate list

– Adds a channel path to a control unit assigned to the device where the LP can access the channel path.

For example, if a device is assigned to a single channel path and the channel path has access to LPs LP1 and LP2, you **cannot** specify a device candidate list of LP3. However, you could specify LP1 and LP3. In this case, IOCP sends a caution message that LP3 cannot access the device.

Using the Device Candidate List to Limit Logical Path Establishment: You can use the device candidate list to limit the establishment of logical paths to a control unit by not allowing an LP to access a device on the control unit. See "Managing the Establishment of Logical Paths" on page 1-33 for more information.

PATH=

ccsid
specifies the logical channel subsystem (CSS) ID associated with this parameter. The CSS ID is a one-digit number in the range 0-n. See Table F-3 on page F-5 to determine the maximum CSS ID your CPC supports.

Each CSS ID must be associated with a control unit attached to this device and must not have been excluded by specifying a null device candidate list with the PART, PARTITION, or NOTPART keyword. You can specify as many CSSs as the attached control units have. If all the attached control units have the same, single CSS ID, the CSS parameter is optional.

chpid
specifies preferred channel paths for the CSSs that can access the device. Specify two hexadecimal digits for a *chpid* assigned to the device for each desired CSS.

IOCP ignores the PATH keyword, if specified, for devices assigned to CFS, CFP, CBS, CBP, ICP, CTC, OSC, OSD, OSE, OSN, FCP, or IQD channel paths (TYPE keyword).

If specified, a CSS always first attempts to use the preferred channel path to initiate I/O requests for the device. If the preferred path is busy or unavailable, the CSS uses the other attached channel paths. See "Path Selection Using a Preferred Path" on page 1-37 for more information.

SCHSET=
specifies the subchannel sets that contain the device. Beginning with z/OS 1.7, z/OS supports devices in subchannel set 1. z/OS supports defining parallel access volumes (PAVs) in subchannel set 1. IOCP does not restrict the types of devices that can be defined in subchannel set 1 except as described in the information that follows.

cssid
specifies the logical channel subsystem (CSS) ID associated with this parameter. The CSS ID is a one-digit number in the range 0-n. See Table F-3 on page F-5 to determine the maximum CSS ID your CPC supports.

Each CSS ID must be associated with a control unit attached to this device and must not have been excluded by specifying a null device candidate list with the PART, PARTITION, or NOTPART keyword. You can specify as many CSSs as the attached control units have. If the device is in the same subchannel set in each CSS that can access it, the CSS parameter is optional (for example, `SCHSET=1`).

ssid

specifies the subchannel sets that contain the device. The SS ID is a 1-digit number in the range 0-*n*. See Table F-3 on page F-5 to determine the maximum SS ID your CPC supports. Some CPCs support multiple subchannel sets in a CSS.

Subchannel sets within a CSS are separate from each other and support a maximum number of devices. See Table F-3 on page F-5 to determine the maximum number of devices each subchannel set on your CPC supports. A logical partition can have duplicate device numbers, provided they are in different subchannel sets.

If you do not specify the SCHSET keyword, the default SS ID is 0. If you specify the CSS parameter but do not specify every CSS that can access the device, the device is defined in subchannel set 0 for the unspecified CSSs. Therefore, the SCHSET keyword is required only to define a device in subchannel set 1 in one or more CSSs.

Devices assigned to CBY, CVC, CFS, CFP, CBS, CBP, or ICP channel paths can be defined only in subchannel set 0.

Devices with different unit addresses attached to the same control unit can be defined in different subchannel sets in the same CSS. A single unit address on a control unit may not be associated with different devices in different subchannel sets in the same CSS.

STADET=

Allows disabling of the Status Verification Facility. STADET=Y enables the facility; STADET=N disables the facility. The default for parallel devices is STADET=N. The default for ESCON and FICON devices is STADET=Y.

IOCP ignores the STADET keyword, if specified, for devices assigned to CFS, CFP, CBS, CBP, ICP, OSC, OSD, OSE, OSN, FCP, or IQD channel paths.

The Status Verification Facility provides the system with a means of indicating that it has been presented with device status that had a valid checking block code (CBC) but that contained a combination of bits that was inappropriate at the time the status byte was presented to the I/O subsystem. The indication is called device-status check.

If a system that provides the Status Verification Facility replaces a system that does not provide the facility, the replacing system may generate device-status-check conditions for events that the replaced system ran without error. In this situation, it may be necessary to disable the facility for the affected subchannel.

If a device can generate busy and status-modifier status in response to initial selection during command chaining, the Status Verification Facility would treat the status as an error when STADET=Y but would not treat the status as an error when STADET=N.

TIMEOUT=

specifies whether the I/O interface timeout function is to be active for the following I/O interface sequences between the channel and the I/O device:

- 4-second timeout for initial selection
- 30-second timeout for data transfer.

The TIMEOUT keyword is meaningful only for CVC channel paths. IOCP ignores the TIMEOUT keyword, if specified, for all other channel path types. IOCP assigns TIMEOUT=Y to devices assigned to CBY channel paths.

Y specifies that the I/O interface timeout function is to be active for all sequences on the I/O interface except as noted in Appendix C, "Characteristics of the I/O Interface Timeout Function." With the timeout function active, if the I/O device fails to complete the initial selection within 4 seconds, the channel ends the I/O request to the I/O device and generates an interface-control-check interruption.

TIMEOUT=**Y** is the default if you do not code the TIMEOUT parameter, provided the keyword is not ignored for the type of channel path assigned to the device.

N specifies that the I/O interface timeout function is to be inactive (timeout is inhibited) for some of the sequences on the I/O interface as described in Appendix C, "Characteristics of the I/O Interface Timeout Function." With the timeout function inactive, the channel waits until the I/O device completes the tag sequence or initiates the next dependent sequence.

UNIT=*device*

specifies the device type. You specify a maximum of 8 alphanumeric or special characters (#, @, or $) to define the device type (such as, 3390 or 3590). IOCP checks the syntax only for alphanumeric or special characters. IOCP does not validate the device value except for devices assigned to OSD, OSE, or OSN channel paths. For OSD and OSE channel paths, IOCP expects devices with unit addresses in the range 00-FD to have a value of OSA and the device with unit address FE to have a value of OSAD. For OSN channel paths, IOCP requires devices with unit addresses in the range 00-FD to have a value of OSN or 3745, and IOCP expects the device with unit address FE to have a value of OSAD.

If you code UNIT=33xxx or 9345x and the device attaches to CVC channel paths (TYPE keyword), the I/O subsystem activates unlimited prefetching of channel command words (CCWs). For more information, see *Enterprise Systems Architecture/390: Principles of Operation*.

To run applications that require parallel basic mode CTC support in an ESCON environment, specify UNIT=BCTC. Any other specification in an ESCON environment results in extended mode CTC support. For more information on ESCON CTC support for parallel CTC basic mode, see *ESCON and FICON Channel-to-Channel Reference*, SB10-7034.

See Appendix D, "List of I/O Devices and Control Units" for more information concerning the configuration of specific devices.

For VM

The UNIT=device parameter of the IODEVICE statement in the IOCP input file has the same value associated with the TYPE parameter of the RDEVICE statement in the SYSTEM CONFIG file. For example, assume the following RDEVICE statement is in the SYSTEM CONFIG file:

```
RDEVICE 100 TYPE 3279
```

The corresponding IODEVICE statement is:

```
IODEVICE ...,UNIT=3279,...
```

UNITADD=*address*

specifies the unit address that is transmitted on the channel path to select the I/O device. You specify two hexadecimal digits in the range of 00-FF. (The control unit address must be physically set to recognize the address that is on

the channel path.) These two hexadecimal digits must match one of the unit addresses specified in the UNITADD parameter of the CNTLUNIT statements that define the control units to which the device is attached.

UNITADD allows you to assign a unit address to a device number in the ADDRESS parameter that does not contain the actual physical unit address of the device. The UNITADD parameter that you specify becomes the unit address that the control unit recognizes for the device.

If you specified a value for count in the ADDRESS parameter, that same number of sequential device numbers applies to the UNITADD parameter. However, the UNITADD parameter plus the number of device numbers minus 1, must not exceed a hexadecimal value of FF.

Coupling Facility Device Definition Considerations: IOCP ignores the UNITADD keyword, if specified, for devices assigned to CFS, CFP, CBS, CBP, and ICP channel paths.

OSC, OSD, OSE, and OSN Device Definition Considerations: For information on how to configure OSC, OSD, OSE, and OSN devices, see "OSA Configuration Considerations" on page 1-25.

FCP Device Definition Considerations: For information on configuring FCP devices, see "Fibre Channel Protocol Support" on page 1-28.

Notes:

1. If you use the UNITADD parameter, you must follow the same rules and restrictions that apply to the last two digits of the ADDRESS parameter. For example, notes in Appendix D, "List of I/O Devices and Control Units" that apply to the unit address specified in the ADDRESS keyword also apply to the unit address specified in the UNITADD keyword.
2. On parallel control units, unit addresses must be unique for each *chpid*. Two control units attached to the same parallel channel path must have unique unit address ranges.
3. For ESCON or FICON devices, unit addresses must be unique for each control unit (not for each *chpid*). Two devices attached to the same ESCON or FICON control unit cannot have the same unit address. However, two devices attached to the same CNC, CTC, FCV, or FC channel path (TYPE keyword) can have the same unit address if they attach to different control units.
4. Unit addresses must be unique for devices defined to an OSC, OSD, OSE, OSN, or FCP control unit. Two devices defined to the same OSC, OSD, OSE, OSN, or FCP control unit cannot have the same unit address.
5. Unit addresses must be unique for each control unit (not for each *chpid*) for IQD or OSD devices. Two devices defined to the same IQD or OSD control unit cannot have the same unit address. However, two devices defined to the same IQD or OSD channel path (TYPE keyword) can have the same unit address if they are defined to different control units.

For VM

To code the UNITADD parameter, you must know how the control unit recognizes the device, that is, by what unit address. You must code the actual physical unit address for the UNITADD parameter in the IODEVICE statement.

For example, the RDEVICE statement for a group of eight 3380 Magnetic Disk Storage units could be:

```
RDEVICE 350-357 TYPE 3380
```

The device numbers for these disk storage units range from 350-357. The control unit, however, recognizes the disk storage units as being attached at unit addresses 40-47.

The UNITADD parameter in the IODEVICE statement should be 40:

```
IODEVICE ADDRESS=(350,8),....UNIT=3380,UNITADD=40
```

The UNITADD parameter in the IODEVICE statement takes the same number (8) as specified in the ADDRESS parameter. This example uses the UNITADD parameter to define device numbers (350-357) that do not contain their physical unit addresses (40-47).

IODEVICE Statement Coding Examples

Example 1:

```
DEV00E IODEVICE ADDRESS=00E,CUNUMBR=10A,MODEL=3,        X
               UNIT=3800,TIMEOUT=Y
```

The preceding statement:

- Defines an IBM 3800 Page Printer Model 3 with an address of 00E.
- Assigns it to control unit number 10A.

Example 2:

```
DEV2DD IODEVICE ADDRESS=(210,8),CUNUMBR=(1A0,1A1),      X
               UNIT=3390,TIMEOUT=Y
```

The preceding statement:

- Defines eight IBM 3390 Direct Access Storage devices.
- Assigns the addresses 210-217 to the devices.
- Assigns the devices to the control unit numbers 1A0 and 1A1, which represent an IBM 3990 Storage Control's two storage directors.

Example 3:

```
DEVDTT IODEVICE ADDRESS=(180,8),CUNUMBR=1EE,            X
               UNIT=3490,STADET=N,UNITADD=00
```

The preceding statement:

- Defines eight IBM 3490 Magnetic Tape Subsystems.
- Assigns the addresses 180-187 to the devices.
- Assigns the devices to control unit number 1EE, which attaches to ESCON channel paths (TYPE=CNC).

- Assigns unit addresses beginning at 00 to the devices for the control unit to recognize.

Because the default unit addresses for the devices are 80-87 and the control unit only recognizes unit addresses 00-0F, specify the UNITADD keyword to make the device unit addresses 00-07.

Example 4:

```
DEVDIR IODEVICE ADDRESS=(2C0),CUNUMBR=(290),            X
               UNIT=SWCH,UNITADD=00
```

The preceding statement:

- Defines an ESCON Director Model 2.
- Assigns the address 2C0 to the device.
- Assigns the device to control unit number 290.
- Assigns the unit address 00 to the device for the control unit to recognize.

Because the default unit address for the device is C0 and the control unit only recognizes unit address 00, specify the UNITADD keyword to make the device unit address 00.

Example 5:

```
IODEVICE ADDRESS=(800,16),CUNUMBR=(800,801),UNIT=3390,  X
              PART=((CSS(0),LP1,LP2),(CSS(1),LPA))
```

The preceding statement:

- Defines 16 IBM 3390 Direct Access Storage devices.
- Assigns the addresses 800-80F to the devices.
- Assigns the devices to the control unit numbers 800 and 801, which represent an IBM 3990 Storage Control's two storage directors, and which have channel paths in CSSs 0 and 1).
- Specifies a device candidate list of LP1 and LP2 in CSS 0 and LPA in CSS 1 so that only those logical partitions can access the devices.

Note: See Appendix E, "Configuration Examples" for more IODEVICE statement coding examples.

IOCP Functions

With IOCP, you can perform the following functions:

- Generate a new IOCDS from a file containing source IOCP statements
- Produce configuration reports from an existing IOCDS.

For z/OS

The rules for coding the JCL EXEC statements for generating an IOCDS in z/OS and for producing configuration reports are in Chapter 3, "Running the z/OS Version of IOCP."

For VM

The rules for using the IOCP command in VM to generate IOCDSs and to produce configuration reports are in Chapter 4, “Running the VM Version of IOCP.”

For VSE

The rules for coding the JCL EXEC statements for generating an IOCDS in VSE and for producing configuration reports are in Chapter 5, “Running the VSE Version of IOCP.”

Generating an IOCDS

IOCP performs the following steps when you specify that you want to generate an IOCDS.

Note: Steps 1-5 are repeated for each input statement as it is read (unless an error is found as indicated in steps 3 and 4).

IOCP:

1. **Reads** each statement from the input device.
2. **Prints** each statement on the output printer.
3. **Checks the syntax** of each statement for correct format. If a syntax error is found (such as a missing parenthesis), IOCP prints an error message on the output printer following the statement that contains the error. IOCP stops checking the syntax of a statement when it encounters the first syntax error in that statement. Therefore, if two or more syntax errors are in a single statement, the second and following errors are found on subsequent runs of IOCP.

   If IOCP finds an error in step 3, IOCP returns to step 1 and performs only steps 1-4 for the remainder of the statements.
4. **Checks the validity** of each statement. For example, IOCP checks that a CNTLUNIT statement has specified a channel path that has been previously defined in a CHPID statement. If an error is found, IOCP prints an error message on the output printer following the statement that contains the error.

   If IOCP finds an error in step 4, IOCP returns to step 1 and performs only steps 1-4 for the remainder of the statements.
5. **Builds** the appropriate identification, channel path, control unit, or I/O device record and enters the record into the IOCDS in storage.

   If more statements remain to be read, IOCP returns to step 1.

   After all of the input statements have been processed and all of the records have been entered into the IOCDS in storage, IOCP performs step 6.
6. **Generates** the IOCDS and makes additional checks. If IOCP finds an error, IOCP sends an error message and then stops.

   After IOCP has successfully generated an IOCDS, IOCP performs step 7.
7. **Produces** the IOCP configuration reports of the IOCDS.

For z/OS and VSE

If requested (by a WRTCDS option other than NO), IOCP performs step 8.

For VM

If requested (by a generation option of the IOCP command other than NOWRTCDS), IOCP performs step 8.

8. **Writes** the generated IOCDS to the support element (SE) hard disk.

For z/OS

IOCP requires authorization before it writes an IOCDS. See “Authorizing an IOCDS Write” on page 3-3.

For VM

The control program checks your privilege class. You must have privilege class C to write the IOCDS to the SE hard disk and privilege class B if you want the IOCDS to be enabled for dynamic I/O configuration changes.

For VSE

This step requires permission from the system operator (by means of message ICP050D) before IOCP writes to the SE hard disk.

Producing Configuration Reports

IOCP performs the following steps when you request configuration reports:

1. Reads one or more IOCDSs from the SE hard disk
2. Prints the IOCP configuration reports that you specify.

If IOCP encounters any errors during processing, it sends appropriate error messages to the output printer. For examples of IOCP configuration reports, see Chapter 7, “IOCP Configuration Reports.”

Chapter 3. Running the z/OS Version of IOCP

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In This Chapter

This chapter describes the following:

- General information
- Authorization required to write an IOCDS
- How to build the IOCP module
- IOCP storage requirements
- JCL statements required to run IOCP functions (with examples)
- Return codes IOCP can set
- Methods you can follow to initially define the I/O configuration or to redefine an existing I/O configuration.

General Information

The z/OS version of the Input/Output Configuration Program (IOCP) runs as a job under control of OS/390, z/OS, or z/OS.e. The IOCP program name is ICPIOCP. By running ICPIOCP, you can verify IOCP input statements for CPCs that require the ICP version of IOCP. See Table F-3 on page F-5 to determine which CPCs require this version of IOCP.

Hardware Configuration Definition (HCD) Notes:

1. You do not need to run IOCP directly to define the I/O configuration to the I/O subsystem. However, HCD does run IOCP when it needs to write an IOCDS.
2. If z/OS is a guest on VM, you cannot write an IOCDS to a CPC that is part of an S/390® microprocessor cluster.
3. When HCD generates an IOCP input source file, it can include comments that HCD uses if the IOCP source file is migrated into HCD. They have special meaning to HCD. These comments begin with *$HCDC$ or *HCD. For more information, see *OS/390 Hardware Configuration Definition User's Guide*, SC28-1848, or *z/OS Hardware Configuration Definition User's Guide*, SC33-7988.
4. When HCD generates an IOCP input source file without PCHIDs, the file must be migrated back into HCD after the CHPID Mapping Tool adds PCHID numbers to the file. HCD can then write an IOCDS or a new IOCP input file can then be created from HCD that stand-alone IOCP can use to write an IOCDS.
5. IOCP warning message ICP065I with return code 4 (RC=4) results when writing an IOCDS if your I/O configuration contains an unsupported function or channel path type for your CPC's current EC level. This in turn results in the following HCD message.

   CBDA676I IOCP completed with warning messages for <*proc-id*>.

   See the IOCP output listing to view the IOCP warning messages.

Use JCL statements to run IOCP. In the EXEC statement, code options in the PARM keyword to direct IOCP to do the following:

- Generate an IOCDS:
  - Read, validate, and check the syntax of input statements
  - Generate an IOCDS based on the configuration defined in the statements
  - Produce reports of the IOCDS
  - When requested, write the generated IOCDS to the support element hard disk.

- Produce configuration reports:
  - Read one or more IOCDSs from the support element hard disk
  - Print IOCP configuration reports (see Chapter 7, “IOCP Configuration Reports”).

Authorizing an IOCDS Write

Writing an IOCDS requires authorization in either of the following ways:

- The z/OS system operator allows you by responding to message ICP050D
- A security product (for example, RACF) defines you as someone authorized to write an IOCDS.

The following conditions apply when you run IOCP directly to write an IOCDS or when you use the Hardware Configuration Definition (which runs IOCP to build an IOCDS):

- If the CBD.CPC.IOCDS resource of the FACILITY class exists in an installed security product (for example, RACF), IOCP does not send message ICP050D to the z/OS operator. IOCP determines your authorization to write an IOCDS from your authorization to update the CBD.CPC.IOCDS resource. If the security administrator has authorized you to update this resource, IOCP writes the IOCDS. If you are not authorized to update the resource, IOCP does not write the IOCDS.
- If the CBD.CPC.IOCDS resource of the FACILITY class does not exist in an installed security product, IOCP sends message ICP050D prompting the z/OS system operator to allow you to write the IOCDS.
- The logical partition running IOCP must have I/O Configuration Control Authority enabled on the support element.

Building the IOCP Module

The IOCP program is on the SYS1.AOSC5 data set of the distribution library (DLIB) and is built when the distribution libraries are loaded during the SMP product install procedure. During the SMP product install procedure, IOCP is link-edited from the DLIB into SYS1.LINKLIB as an APF-authorized program, authorization code AC=1, with the load module name ICPIOCP.

IOCP Storage Requirements

IOCP uses a variable amount of storage based on the type of IOCDS it is processing. Specify a region size of 73MB or 0MB, in the REGION parameter of the JOB statement, to ensure sufficient space for the job. However, to determine the specific IOCP storage requirements for your CPC, see Table F-3 on page F-5.

Coding the JCL EXEC Statement for Generating an IOCDS

In the EXEC statement, code the name of the IOCP program in the PGM parameter and the following PARM options to generate an IOCDS. (The examples later in this chapter describe the JOB and DD statements for an IOCP job.)

Note: PARM parameter defaults allow you to generate an IOCDS and to produce reports. However, the defaults do not allow you to write an IOCDS to the support element hard disk.

IOCP processes all input statements and parameters. IOCP flags as errors any non-IOCP input and also indicates errors found in IOCP statements and parameters. IOCP prints all input, including all comment cards (all cards with an asterisk (*) in column 1 or .* in columns 1 and 2).

```
PARM='WRTCDS=Ax|NO,LINECOUNT=n|55,CHECKCPC=YES|NO'
```

WRTCDS=

specifies whether or not IOCP writes an IOCDS to the support element hard disk. All of the WRTCDS options except NO cause IOCP to write an IOCDS. You can write an IOCDS only from an authorized logical partition (that is, I/O Configuration Control Authority is enabled).

IOCP writes the IOCDS only if:

- No errors are encountered during IOCP processing
- The z/OS system operator grants permission in response to message ICP050D or the user attempting to write the IOCDS is authorized by an installed security product (for example, RACF)
- The IOCDS is not write protected.

Request IOCP to write the IOCDS only after you have done the following:

- Checked the syntax of the input statements
- Generated an IOCDS based on the configuration defined in the statements
- Reviewed reports on the generated IOCDS
- Checked to see whether or not the generated IOCDS is correct.

To replace a write protected IOCDS, you must first remove write protection. Use the **Disable Write Protection** function under **Options** on the Input/Output Configuration panel to remove write protection.

HCD and Write Protection: You can use HCD to set and remove IOCDS write protection. For more information, see *z/OS Hardware Configuration Definition User's Guide*, GC33-7988.

When IOCP writes an IOCDS to the support element hard disk, it overwrites the previous configuration data in that IOCDS, even if that IOCDS is the active IOCDS. (The active IOCDS is the one used for the last power-on reset or the last dynamic activation from the system control program [SCP].)

The valid options for WRTCDS are A*x* and NO.

A*x* specifies that IOCP should write the A*x* IOCDS (where *x* is 0, 1, 2, or 3) to the support element hard disk.

NO

specifies that IOCP should not write the IOCDS to the support element hard disk.

NO is the default if you do not code WRTCDS.

Code or use the default WRTCDS=NO when you test the input file and do not want to write to the support element hard disk until you have successfully tested and checked the input file.

Also, you must code or use the default WRTCDS=NO when you run IOCP on a CPC that does not require ICPIOCP. However, certain CPCs allow an IOCDS to be written in anticipation of supporting ICPIOCP.

LINECOUNT=

n specifies the number of lines that IOCP is to print on a page of the IOCP output listing and configuration reports, including the heading of the report. Code a decimal value in the range of 20-99.

55 is the default number of lines (including the heading) that IOCP prints on a page of the IOCP output listing and configuration reports.

CHECKCPC=

YES
specifies that IOCP generates an IOCDS as follows:

- Based on the CPC on which IOCP is running if writing an IOCDS. IOCP ignores the SYSTEM= keyword on the ID statement if specified.
- Based on the CPC on which IOCP is running if not writing an IOCDS and the SYSTEM= keyword was not specified.
- Based on the SYSTEM= parameter if specified and IOCP is not writing an IOCDS.

YES is the default.

NO
specifies that IOCP writes the IOCDS in preparation of a CPC upgrade. IOCP generates an IOCDS based on the SYSTEM= parameter on the ID statement and writes the IOCDS to the current CPC. See “Machine Rules” on page F-2 to determine which SYSTEM= parameters are valid with CHECKCPC=NO and which CPCs can have ICPIOCP write an IOCDS to them.

The IOCDS cannot be used to power-on reset the current CPC until it is upgraded to the type of CPC that the IOCDS supports. For example, if IOCP generates an IOCDS for a 2084 CPC using SYSTEM=(2084,1) and writes the IOCDS to a general purpose 2064 model 1xx, the IOCDS cannot be used for power-on reset until the 2064 is upgraded to a 2084 model CPC.

A WRTCDS option other than NO is required. Also, the SYSTEM keyword on the ID statement must be specified.

Attention: Use CHECKCPC=NO only in preparation of a CPC upgrade. After the upgrade, IBM recommends that you write an IOCDS using CHECKCPC=YES at your earliest convenience. This prevents the possibility of using the initial IOCDS for a second upgrade to a CPC, which will not support the IOCDS and will fail power-on reset.

LPAR=

YES
specifies that the IOCDS is generated for a CPC operating in LPAR mode. Although LPAR=YES is currently accepted, IOCP will disallow it in the future.

JCL Examples of Generating an IOCDS

Example 1

The following example shows the JCL statements used to check an IOCP input file. IOCP requires SYSIN as the ddname for the input data set and SYSPRINT as the ddname for the output data set. Reports are sent to SYSOUT.

```
//IOCP1      JOB   REGION=0M,...
//TEST1      EXEC  PGM=ICPIOCP,PARM=('WRTCDS=NO',
//       'LINECOUNT=60')
//SYSIN      DD    DSNAME=USER.IOCD1.CARDS,DISP=SHR
//SYSPRINT   DD    SYSOUT=A,DCB=(RECFM=FA)
```

In the example:

IOCP1 specifies the JOB statement. Code parameters on the JOB statement that your installation requires. To determine the region size to use, see "IOCP Storage Requirements" on page 3-3.

TEST1
specifies the EXEC statement and the program (ICPIOCP) to run. The PARM options are:

WRTCDS=NO
specifies not writing the IOCDS to the support element hard disk

LINECOUNT=60
specifies 60 lines of output on the reports IOCP produces.

SYSIN specifies the DD statement that defines the input data set, which consists of statements with a record length of 80 bytes.

SYSPRINT
specifies the DD statement that defines the output data set to receive messages and reports. (Note that IOCP records contain ANSI device control characters and have a length of 133 bytes.)

Example 2

The following example shows the JCL statements to process an IOCP input file, to generate an IOCDS, and to write the generated IOCDS to the A0 IOCDS on the support element hard disk. Reports of the generated IOCDS are sent to SYSOUT.

IOCP requires the ddnames SYSIN for the input data set and SYSPRINT for the output data set.

```
//IOCP2     JOB   REGION=0M,...
//WRITE1    EXEC  PGM=ICPIOCP,PARM='WRTCDS=A0'
//SYSIN     DD    DSNAME=USER.IOCD2.CARDS,DISP=SHR
//SYSPRINT  DD    SYSOUT=A,DCB=(RECFM=FA)
```

In the example:

IOCP2 specifies the JOB statement. Code parameters on the JOB statement required by your installation. To determine the region size to use, see "IOCP Storage Requirements" on page 3-3.

WRITE1
specifies the EXEC statement and the program (ICPIOCP) to run. The PARM options are:

WRTCDS=A0
specifies writing the A0 IOCDS to the support element hard disk.

LINECOUNT=55
is the default number of lines of output for each page on the configuration reports.

SYSIN specifies the DD statement that defines the input data set, which consists of statements with a record length of 80 bytes.

SYSPRINT
specifies the DD statement that defines the output data set to receive messages and reports. (Note that IOCP records contain ANSI device control characters and have a length of 133 bytes.)

Coding the JCL EXEC Statement for Producing Configuration Reports

In the EXEC statement, code the name of the IOCP program in the PGM parameter and the following PARM options to produce configuration reports. (The example later in this chapter describes the JOB and DD statements for an IOCP job.)

You must code the REPORT option to receive reports of an IOCDS.

```
PARM='REPORT=(Ax|A),LINECOUNT=n|55'
```

REPORT=
specifies that IOCP read one or more IOCDSs from the support element hard disk to produce configuration reports. More than one REPORT option can be coded. If only one option is coded, you can omit the parentheses.

Notes:

1. You cannot use ICPIOCP to produce reports for IOCDSs created by IYPIOCP, IZPIOCP, or IXPIOCP.
2. An IOCDS can be read only from an authorized logical partition (that is, I/O Configuration Control Authority is enabled).

The valid options for REPORT= are:

A*x* specifies the A*x* IOCDS, where *x* is 0, 1, 2, or 3.

A specifies all the A*x* IOCDSs. See Table F-2 on page F-3 to determine the Ax IOCDSs your CPC supports.

LINECOUNT=

n specifies the number of lines that IOCP is to print on a page of the IOCP output listing and configuration reports, including the heading of the report. Code a decimal value in the range 20-99.

55 Is the default number of lines (including the heading) that IOCP prints on a page of the IOCP output listing and configuration reports.

Conditions for Coding the REPORT Options

- REPORT can be coded only if the IOCDSs to be reported were written with ICPIOCP; otherwise, IOCP ends with an error.
- REPORT cannot be coded if you code the WRTCDS or CHECKCPC option. You cannot read an input file and generate an IOCDS (which includes reports of the generated IOCDS), and produce reports by means of the REPORT option in the same job.

- Several REPORT options can be coded; redundant or duplicate values are allowed. For example, REPORT=(A0,A1,A2,A3) is the same as REPORT=A. Regardless of the order in which you specify the options, the reports are always produced in the following order: A0, A1, A2, A3.

JCL Example of Producing Configuration Reports

The following example shows the JCL statements to produce IOCP reports of all the A*x* IOCDSs read from support element hard disk. Reports are sent to SYSOUT. Note that you do not need a DD statement to access an IOCDS from the support element hard disk.

IOCP requires SYSPRINT as the ddname for the output data set.

```
//IOCP5     JOB   REGION=0M,...
//REPORT2   EXEC  PGM=ICPIOCP,PARM='REPORT=A'
//SYSPRINT  DD    SYSOUT=A,DCB=(RECFM=FA)
```

In the example:

IOCP5 specifies the JOB statement. Code the parameters on the JOB statement that your installation requires. To determine the region size to use, see "IOCP Storage Requirements" on page 3-3.

REPORT2
specifies the EXEC statement and the program (ICPIOCP) to run. The PARM option of REPORT=A specifies reading all the A*x* IOCDSs from the support element hard disk to produce reports.

SYSPRINT
specifies the DD statement that defines the output data set to receive messages and reports. (Note that IOCP records contain ANSI device control characters and have a length of 133 bytes.)

Return Codes

When you run the z/OS version of IOCP, it returns one of the following codes at the completion of the job:

Return Code		
Decimal	**Hex**	**Description and Action**
0	0	IOCP has completed the requested function without error and may have sent one or more informational messages. If so, the informational messages in the output listings or the reports describe the specific conditions.
2	2	IOCP has completed the requested function without error but has issued one or more caution messages. The caution messages in the output listings or the reports describe the specific conditions.
4	4	IOCP has completed the requested function without error but has issued one or more warning messages. The warning messages in the output listings or the reports describe the specific conditions.
8	8	IOCP has encountered an error and has ended processing before completing the requested function. The error message in the output listing describes the specific condition.

Return Code		Description and Action
Decimal	Hex	
12	C	IOCP has ended because the output data set DCB failed to open. IOCP was unable to print messages or reports. Ensure that the DD statement for the output data set is correctly specified.
16	10	IOCP has ended because it could not obtain the needed storage by means of the GETMAIN statement. To determine the region size to use, see “IOCP Storage Requirements” on page 3-3.

Methods of Running the z/OS Version of IOCP

This topic suggests the steps that you can use to run the z/OS version of IOCP to do the following:

- Define and check the I/O configuration data to prepare for a new CPC
- Redefine and replace an I/O configuration on an installed CPC.

Note: In z/OS, you use HCD to define and change your I/O configuration. HCD runs IOCP to write an IOCDS.

Initial Definition of I/O Configuration Data

The following example describes the steps that an installation can use to initially define and check the I/O configuration data to prepare for the installation of a new CPC.

1. Determine, from your physical plan, the I/O configuration requirements that must be met to install the CPC.
2. Use HCD on a running z/OS system to define your I/O configuration for the new CPC. HCD validates the I/O configuration rules. When the definition is complete, build a production IODF.
3. If you are installing a new CPC, do one of the following:
   - If the new CPC will be connected using a LAN to the CPC where HCD is running and that CPC is able to remotely write an IOCDS, you can use HCD to write the new IOCDS to the CPC after it is installed. HCD uses the APF-authorized ICPIOCP program to write an IOCDS. Inform the service representative which IOCDS to use.
   - If you are upgrading an existing CPC, you may be able to use HCD to write an IOCDS to your current CPC in preparation for the upgrade. See “Machine Rules” on page F-2 to determine which CPCs can write an IOCDS in preparation for an upgrade and which CPCs can have ICPIOCP write an IOCDS to them. If you can write an IOCDS to your current CPC in preparation for upgrading it to a new CPC, do so and inform the service representative which IOCDS to use. This is the preferred method for writing the initial IOCDS when upgrading a CPC.
   - If the new CPC will not be connected using a LAN to the CPC where HCD is running or you are not upgrading or cannot write an IOCDS in preparation for the upgrade, use HCD to produce an IOCP input file. Download the input file to diskette. If the file is too big to fit on a diskette, compress it using a zip compatible program. Source from a diskette must be in DOS file format or have been compressed. Give the diskette to the service representative, who uses this input file and stand-alone IOCP to write the IOCDS for the new

CPC. See “Creating a New IOCDS in a New Central Processor Complex (CPC)” on page 6-8 for an example using the stand-alone version of IOCP.

Note: See “Authorizing an IOCDS Write” on page 3-3 for a description of how to authorize the write of an IOCDS.

4. The service representative performs a power-on reset of the new CPC with the appropriate IOCDS.
5. The service representative IPLs the z/OS system with the IODF built under Step 2.

Redefinition and Replacement of I/O Configuration Data

The following example describes the steps the installation can use to replace the existing I/O configuration data on a CPC.

1. Use HCD to update your I/O configuration for the hardware and software in a work IODF based on your currently active production IODF.
2. Build a new production IODF from the updated work IODF.
3. If the changes can be dynamically performed, use HCD or the z/OS Activate system command to dynamically change the I/O configuration in the Hardware System Area (HSA) and in the z/OS system. The updated IODF now becomes the new active IODF. The details of dynamic I/O reconfiguration are found in *z/OS Hardware Configuration Definition Planning*, GA22-7525.
4. Write the new IOCDS to the support element of the CPC using HCD. HCD uses IOCP to write an IOCDS. If the IOCDS slot is write protected on the support element, use the **Disable Write Protection** function under **Options** on the Input/Output Configuration panel.

   Note: See “Authorizing an IOCDS Write” on page 3-3 for a description of how to authorize the write of an IOCDS.
5. Use HCD to switch the IOCDS to become the active one for the next power-on reset.
6. If the I/O configuration changes cannot be dynamically performed (see Step 3), perform a power-on reset of the CPC using the new IOCDS. Perform an IPL of the z/OS system with the new production IODF.
7. Test the new configuration following the procedures established for your site.

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In This Chapter

This chapter describes the following:

- General information
- IOCP storage requirements
- CMS IOCP commands that run these functions (with examples)
- Return codes IOCP can set
- Methods you can follow to initially define the I/O configuration or to redefine an existing I/O configuration

General Information

The VM version of IOCP runs under the control of z/VM.

Invoke the VM version of IOCP in the CMS environment. The CMS IOCP command runs IOCP and has options that allow you to request the following IOCP functions:

1. Generate an IOCDS.

   IOCP reads, validates, and checks the syntax of input statements. It generates an IOCDS based on the configuration defined in the statements. It produces reports of the IOCDS; and, when requested, IOCP writes the generated IOCDS to the support element hard disk.

2. Produce configuration reports.

   IOCP reads one or more IOCDSs from the support element hard disk and prints the IOCP configuration reports. (See Chapter 7, “IOCP Configuration Reports” for examples.)

Hardware Configuration Definition (HCD) Notes

1. When using HCD to define the I/O configuration for VM, you do not need to run IOCP directly to define the I/O configuration to the I/O subsystem. However, HCD does run IOCP when it needs to write an IOCDS. **HCD users should always use HCD (CBDSIOCP EXEC) to write an IOCDS from VM.**
2. When HCD generates an IOCP input source file, it can include comments that HCD uses if the IOCP source file is migrated into HCD. They have special meaning to HCD. These comments begin with *$HCDC$ or *HCD. For more information, see *z/VM Dynamic I/O Configuration Planning and Administration*, SC24-6044.
3. When HCD generates an IOCP input source file without PCHIDs, the file must be migrated back into HCD after the CHPID Mapping Tool adds PCHID numbers to the file. HCD can then write an IOCDS or a new IOCP input file can then be created from HCD, which a stand-alone IOCP can use to write an IOCDS.
4. IOCP warning message ICP065I with return code 4 (RC=4) results when writing an IOCDS if your I/O configuration contains an unsupported function or channel path type for your CPC’s current EC level. This in turn results in the following HCD message.

   ```
   CBDA676I   IOCP completed with warning messages for <proc-id>.
   ```

   See the IOCP output listing to view any IOCP warning messages.

IOCP Storage Requirements

IOCP uses a variable amount of storage based on the type of IOCDS it is processing. The IOCP command requires a maximum of 73MB of storage to run, which is in addition to the storage CMS requires. However, to determine the specific IOCP storage requirements for your CPC, see Table F-3 on page F-5.

The IOCP Command

The format of the IOCP command is shown in the following. The options are explained in the text that follows the format.

```
IOCP      [fn] [(options...[)]]

          Program Options:
          ICP

          IOCDS Generation Options:
          CHECKCPC              NOWRTCDS
          NOCHKCPC              WRTAx

          Configuration Report Options:
          RPTAx
          RPTA

          Listing Control Options:
          LINECOUN (55)         DISK
          LINECOUN (nn)         PRINT
                                NOPRINT

          System Terminal Options:
          TERMINAL              WARNING
          NOTERM                NOWARN

          IOCP CMS Utility Options:
          NODYN
          DYN
```

fn specifies the file name of the input file of IOCP statements or of the output listing file, depending on the options you specify on the command line. A file name is required only when input is from a disk or output is to a disk.

- When you specify IOCDS generation options, *fn* is the following:
  - The file name of the input file that contains the IOCP statements.
  - The file name of the output file.

    If IOCP finds no errors, the output file will contain the configuration reports of the IOCDS that IOCP generated from your input as well as a list of your input. If IOCP does find errors, the output file will contain only a list of the input file and any errors that IOCP finds.
- When you specify configuration report options, *fn* is the following:
  - The file name of the output file.

    The output file contains the configuration reports of the IOCDSs you request from the support element.

The IOCP CMS utility requires that the IOCP input file reside on a read/write disk unless the NODYN option is specified and the IOCP input file is not dynamic-capable.

IOCP issues, by default, the following FILEDEF commands for the SYSIN (input to IOCP) and SYSPRINT (output from IOCP) ddnames:

```
FILEDEF SYSIN DISK fn IOCP * (RECFM FB LRECL 80 BLOCK 800

FILEDEF SYSPRINT DISK fn LISTING fm (RECFM FBA LRECL 133 BLOCK 1330
```

IOCP obtains *fn* from the file name entered in the IOCP command.

IOCP obtains *fm* by checking the disk that contains the input file. If the disk is read/write, IOCP writes back to the same disk. However, if the disk is an extension to a disk, IOCP writes to the parent disk. If neither of these is true, IOCP writes to the A-disk (provided it is read/write).

Because the default FILEDEF commands specify DISK, you must use a file name in the IOCP command unless you override those default FILEDEF commands. If you want to override a default FILEDEF command, issue your own FILEDEF command before running IOCP. Note that the SYSPRINT FILEDEF is automatically overridden if you specify PRINT or NOPRINT in the IOCP command. Note also that if you specify a SYSPRINT FILEDEF, the IOCP command uses a system terminal option of NOTERM, which cannot be overridden.

The input file type is, by default, IOCP. If the input file has a file type other than IOCP, issue a FILEDEF command to override the default file type.

Program Options

A program option designates the IOCP program for which the input IOCP statements were written.

The syntax of input IOCP statements can be checked on any CPC in which the CMS IOCP command is valid. Syntax checking can be performed when the CPC for which the input IOCP statements were written is not available.

The valid program options are as follows:

ICP
specifies that the ICP version of IOCP is to process the command options and input file to generate an IOCDS. ICP refers to the first three characters of the ICPPCNTL IOCP module and to the z/OS program name ICPIOCP. See Table F-3 on page F-5 to determine which CPCs require this version of IOCP.

The ICP program option is the default for the IOCP command on 2084, 2086, and 2094 CPC's.

xxx
Three-character program option other than ICP. It is associated with CPCs that do not require the ICP version of IOCP.

For example, the IYP program option runs the version of IOCP that is required on 2064 and 2066 CPCs. The IYP program option is the default for the IOCP command on 2064 and 2066 CPCs.

The IZP program option runs the version of IOCP that is required on 9021, 9121, 9672, 2003, 3000, and 7060 CPCs that support the ESCON architecture and multiple image facility (MIF). The IZP program option is the default for the IOCP command on 9672, 2003, 3000, and 7060 CPCs.

The IXP program option runs the version of IOCP that is required on ES/3090™, 9021, 9121, and 9221 CPCs that support the ESCON Architecture, but not the

multiple image facility (MIF). The IXP program option is the default for the IOCP command on 9021, 9121, and 9221 CPCs.

IOCP programs are designed to generate IOCDSs for specific CPCs. However, some IOCP programs can generate an IOCDS for a CPC it was not designed to support. For example, if IOCP writes an IOCDS with the ICP program option on a CPC that does not support ICP IOCP, a power-on reset failure occurs if the IOCDS is used before the CPC is upgraded to a CPC that supports ICP IOCP.

IOCP programs are also designed to report on IOCDSs for specific CPCs. An IOCP program can report only on IOCDSs that were written by the same IOCP program. For example, if IOCP writes an IOCDS with the ICP program option, only the ICP IOCP program can print a report. Errors occur when an IOCP program other than the one that generated the IOCDS tries to report on an IOCDS.

IOCDS Generation Options

IOCP writes an IOCDS only if:

- No errors are encountered during IOCP processing.
- The user issuing the IOCP command has the correct privilege class. See Note 1 in "IOCP Command Usage Notes for VM" on page 4-9.
- The IOCDS is not write-protected.
- You specify a write IOCDS option WRTA*x*.

Use a write option WRTA*x* after you have:

- Checked the syntax of the input statements
- Generated an IOCDS based on the configuration defined in the statements
- Reviewed reports on the generated IOCDS
- Checked to see whether or not the I/O configuration generated by IOCP corresponds to the I/O configuration in the system configuration file (SYSTEM CONFIG) on the parm disk or the obsolete real I/O configuration file (HCPRIO) in the CP nucleus. Note that while IOCP must define the entire I/O configuration, only the devices that VM cannot sense during IPL must be defined in the SYSTEM CONFIG or HCPRIO files.

If you want to replace an IOCDS that is write-protected, you must also remove the write protection. Use **Disable Write Protection** under **Options** on the Input/Output Configuration panel to remove write protection.

When IOCP writes the generated IOCDS to the support element hard disk, the previous configuration data in that IOCDS is overlaid and lost, even if that IOCDS is the active IOCDS. (The active IOCDS is the one used for the last power-on reset or the last dynamic activation from the system control program [SCP].)

NOWRTCDS
NOWRT

specifies that IOCP is not to write an IOCDS to the support element hard disk. This option is a default.

Use the NOWRTCDS option when:

- You are checking the syntax of the input file and do not want to write to the support element hard disk until you have successfully checked the input file or
- You are using a CPC that does not require the IOCP that this user's guide describes.

However, certain CPCs allow an IOCDS to be written in anticipation of supporting ICP IOCP.

When you specify the NOWRTCDS option and IOCP finds no errors, the output file contains the configuration reports of the IOCDS that IOCP generates from your input, along with a list of your input file. If IOCP finds errors, your output file contains only a list of your input file and any errors that IOCP finds.

WRTA*x*
WA*x*
specifies that IOCP is to write the A*x* (where *x* is 0, 1, 2, or 3) IOCDS to the support element hard disk.

Note: An IOCDS can be written only from an authorized logical partition (that is, I/O Configuration Control Authority is enabled).

CHECKCPC
specifies that IOCP should generate an IOCDS as follows:

- Based on the CPC on which IOCP is running if writing an IOCDS. IOCP ignores the SYSTEM= keyword on the ID statement if specified.
- Based on the CPC on which IOCP is running if not writing an IOCDS and the SYSTEM= keyword was not specified.
- Based on the SYSTEM= parameter if specified and IOCP is not writing an IOCDS.

This option is the default.

NOCHKCPC
specifies that the IOCDS is being written in preparation of a CPC upgrade. IOCP generates an IOCDS based on the SYSTEM= parameter on the ID statement and writes the IOCDS to the current CPC. See “Machine Rules” on page F-2 to determine which CPCs can write an IOCDS with NOCHKCPC and which CPCs can have an IOCDS written to them by ICP IOCP.

The IOCDS cannot be used to power-on reset the current CPC until it is upgraded to the type of CPC supported by the IOCDS. For example, if IOCP generates an IOCDS for a 2084 CPC using SYSTEM=(2084,1) and writes the IOCDS to a general purpose 2064 model 1*xx*, the IOCDS cannot be used for power-on reset until the 2064 is upgraded to a 2084 model CPC.

A WRTA*x* or WA*x* option is required. Also, the SYSTEM keyword on the ID statement must be specified.

Attention:
Use NOCHKCPC only in preparation of a CPC upgrade. After the upgrade, IBM recommends that you write an IOCDS using CHECKCPC at your earliest convenience. This prevents the possibility of using the initial IOCDS for a second upgrade to a CPC, which will not support the IOCDS and will fail power-on reset.

LPAR
specifies that the IOCDS that is generated is for a CPC operating in LPAR mode. Although LPAR is currently accepted, IOCP will disallow it in the future.

Configuration Report Options

The valid options for reading an IOCDS and producing configuration reports are RPTA*x* and RPTA.

The user issuing the IOCP command to produce configuration reports must have the correct privilege class. See Note 1 in “IOCP Command Usage Notes for VM” on page 4-9.

Note: You cannot use the ICP version of IOCP to produce reports for IOCDSs created by the IYP, IZP, or IXP versions of IOCP.

RPTA*x*
RA*x*
specifies that IOCP is to read the A*x* (where *x* is 0, 1, 2, or 3) IOCDS from the support element hard disk and is to generate a configuration report of that data set.

Note: An IOCDS can be read only from an authorized logical partition (that is, I/O Configuration Control Authority is enabled).

RPTA
RA
specifies that IOCP is to read all the A*x* IOCDSs from the support element hard disk and is to generate configuration reports of those data sets. See Appendix F, “Machine Limits and Rules” to determine the A*x* IOCDSs your CPC supports.

Note: An IOCDS can be read only from an authorized logical partition (that is, I/O Configuration Control Authority is enabled).

Listing Control Options

LINECOUN (55)
LINECOUN (*nn***)**
specifies the number of lines (from 20 to 99) to print on each page including the report heading. The default is LINECOUN (55). Note that you must specify the number of lines if you use this option.

DISK
DI specifies that IOCP is to place the output listing on a minidisk. DISK is a default option.

PRINT
PR
specifies that IOCP is to send the output listing to the printer.

NOPRINT
NOPR
specifies that IOCP is not to generate any output listing.

System Terminal Options

TERMINAL
TERM
specifies that IOCP is to write diagnostic information from the IOCP output to your terminal. Diagnostic information consists of either of the following:

- An IOCP message (see Chapter 8, “IOCP Messages”) and, preceding this message, the non-blank line that caused the diagnostic message
- A display of the total message count for the IOCP output.

TERMINAL is a default option.

NOTERM
specifies that IOCP is to suppress the display of diagnostic messages at your terminal.

WARNING
WARN
specifies that IOCP is to write IOCP warning and caution messages to the terminal. This option is valid only if you specify the TERMINAL option. WARNING is a default option.

NOWARN
specifies that IOCP is to suppress the writing of warning and caution messages at your terminal.

IOCP CMS Utility Options

These options are valid only for the IOCP CMS utility. If an IOCP CMS utility option is specified, the utility processes the option and then calls the IOCP command with all specified options except the utility options. The IOCP command does not accept the IOCP utility options.

NODYN
specifies that the IOCP CMS utility is not to enable the dynamic I/O configuration capability of any resulting IOCDS. This option is the default. NODYN disables any dynamic-capability of an IOCP input file. NODYN requires that the IOCP input file reside on a read/write disk unless the file is not dynamic-capable.

Note: You cannot specify utility option NODYN along with the MAXDEV keyword or reserved logical partitions on the RESOURCE statement.

DYN
specifies that the IOCP CMS utility is to enable the dynamic I/O configuration capability of any resulting IOCDS. The DYN option requires the following:

- Privilege class B
- An IOCP input file residing on a read/write disk.

Restrictions

CMS/DOS does not recognize the IOCP command.

IOCP Command General Usage Notes

This topic lists some general notes to keep in mind when you send the IOCP command. Some aspects of using the command, though, vary with the operating system on which you run IOCP. For usage notes specific to your operating system, see the topics that immediately follow this topic.

Notes:

1. Some IOCP command options cancel other IOCP command options. For this reason, when you code the IOCP command, do not combine IOCDS generation options with configuration report options. (However, IOCP allows multiple configuration-report options.)

   If you inadvertently code conflicting options in the same IOCP command, IOCP will use the last entered of those conflicting options; no warning message is sent.
2. The write option WRTA*x*, is incorrect if the data set that you wish to replace is write-protected. (To remove write protection, use **Disable Write Protection** under **Options** on the Input/Output Configuration panel on the support element.)

3. The TERMINAL and WARNING options are not active if you send your own SYSPRINT FILEDEF command.

IOCP Command Usage Notes for VM

This topic lists some notes to keep in mind when you use the IOCP command.

Notes:

1. You must have the correct privilege class. The control program checks your privilege class when IOCP attempts to read or write an IOCDS. You must have privilege class C to read or write an IOCDS; you must also have privilege class C to avoid IOCP warning message ICP068I when performing a deck verification (option NOWRTCDS). You must have privilege class B if you specify IOCP utility option DYN.

   If you attempt to read from an IOCDS or write an IOCDS and you do not have the required privilege classes, you receive the following messages:

   ```
   ICP402I  IOCP RECEIVED AN UNEXPECTED RESPONSE CODE OF 01F0 HEX
             ATTEMPTING READ OR WRITE OF AN IOCDS

   ICP051I  IOCP VERSION nn.nn.nnn TERMINATED. CODE=xx
   ```

   Note: You can also receive the previous messages if you attempt to read or write an IOCDS when another user is reading or writing an IOCDS. The messages are printed on the SYSPRINT device. IOCP then stops processing.

   If you attempt to read or write an IOCDS or perform a deck verification (option NOWRTCDS) and you do not have the required privilege classes, you receive the following message:

   ```
   ICP068I **WARNING** IOCP WAS UNABLE TO DETERMINE IF THE CONFIGURATION
            IS USABLE ON THE EC LEVEL OF THIS PROCESSOR (CODE 01F00000)
   ```

   If you specify the DYN IOCP utility option and do not have the required privilege class, you receive the following message from the IOCP utility:

   ```
   Error occurred generating hardware token.
   CP QUERY TOKEN command was not recognized.
   IOCP module has not been invoked.
   ```

2. For z/VM 4.4.0 and prior releases, if you do not have CP APAR VM63426 installed, you receive the following message:

   ```
    ICP068I **WARNING** IOCP WAS UNABLE TO DETERMINE IF THE CONFIGURATION
              IS USABLE ON THE EC LEVEL OF THIS PROCESSOR (CODE 40F00000)
   ```

3. You receive the following error messages and IOCP processing stops if you attempt to update an IOCDS or request a configuration report for an IOCDS while IOCP is running on a CPC that does not require the version of IOCP described in this user's guide:

   ```
   ICP400I  READ/WRITE OF IOCDS IS INVALID ON THIS PROCESSOR (nnnn)

   ICP051I  IOCP VERSION nn.nn.nnn TERMINATED. CODE=xx
   ```

   You receive similar error messages if you attempt to update an IOCDS or request a configuration report for an IOCDS on a CPC that supports ICP IOCP and a program option other than ICP was specified.

4. If you and another user attempt to read the same IOCDS at the same time, or if you and another user attempt to write the same IOCDS at the same time, you or the other user will receive the following messages:

```
ICP405I  IOCP RECEIVED AN UNEXPECTED RETURN CODE OF 09 OR 65
                  HEX ATTEMPTING READ OR WRITE OF AN IOCDS

ICP051I  IOCP VERSION nn.nn.nnn TERMINATED. CODE=xx
```

You should wait several minutes and again attempt to read or write that IOCDS by issuing another IOCP command.

5. You must define your I/O configuration for the CPC using IOCP statements. When you perform an initial program load (IPL) of VM, VM creates its software I/O configuration by sensing the devices in the hardware I/O configuration. If all the devices return all of the information VM needs, VM completes its software I/O configuration. If not, you must specify this information in the system configuration file or the obsolete real I/O configuration file.
6. If you attempt to write an IOCDS and either the IOCP abnormally ends or you send the CMS command HALT EXECUTION (HX) while IOCP is running, you prevent another authorized user from using an IOCDS. Under these circumstances, the system may have locked the IOCDS for you. If the other user attempts to write to any IOCDS, the following messages are sent:

   ```
   ICP401I  READ/WRITE IOCDS FACILITY TEMPORARILY BUSY (RC=4). RETRY LATER

   ICP051I  IOCP VERSION nn.nn.nnn TERMINATED. CODE=xx
   ```

   The *xx* is a code that indicates IOCP encountered an error while trying to write the locked IOCDS.

   If the other user attempts to read the IOCDS that has been locked, the following messages are displayed to that user:

   ```
   ICP403I  LEVEL Ax IOCDS IS INVALID

   ICP051I  IOCP VERSION nn.nn.nnn TERMINATED. CODE=xx
   ```

   The *xx* is a code that indicates IOCP encountered an error while trying to read the locked IOCDS.

   These messages are sent each time the other user tries to run IOCP until you do one of the following:

   - Rerun IOCP to completion, successfully writing the locked IOCDS to the support element.
   - Send a SYSTEM RESET command to reset your virtual machine.
   - Send a LOGOFF command to log off your virtual machine.

   The other user will then be able to access any of the IOCDSs.

Examples of Generating an IOCDS

Example 1

This example shows the IOCP command options that check an IOCP input file. IOCP displays any messages at your terminal. The output file MIFILE LISTING contains the configuration reports for the configuration described by the input file MIFILE IOCP.

```
IOCP MIFILE (ICP NOWRTCDS LINECOUN (60)
```

MIFILE
is the name of the CMS file (file type IOCP) that contains IOCP statements.

ICP
specifies running the ICP IOCP program (ICPPCNTL).

NOWRTCDS
specifies that IOCP should not write the IOCDS to the support element hard disk.

LINECOUN (60)
specifies that IOCP should print 60 lines of output on each page of the configuration reports.

Example 2

This example shows the IOCP command options used to do the following:

- Process an IOCP input file
- Generate an IOCDS
- Write the generated IOCDS to the A0 slot on the support element hard disk.

```
IOCP NEWIOCDS (ICP WRTA0
```

NEWIOCDS
is the name of the CMS file (file type IOCP) that contains IOCP statements.

ICP
specifies running the ICP IOCP program (ICPPCNTL).

WRTA0
specifies that IOCP is to write the IOCDS generated to the A0 slot on the support element hard disk.

Examples of Producing a Configuration Report

This example shows the IOCP command options used to produce a report of every IOCDS on the CPC. These reports allow you to analyze your installation's present I/O configuration.

```
IOCP IOCDSRPT (ICP RPTA LINECOUN (65) DISK NOTERM
```

IOCDSRPT
is the file name of the output file that contains the configuration reports. Note that the file type is LISTING.

ICP
specifies running the ICP IOCP program (ICPPCNTL).

RPTA
specifies that IOCP should create a configuration report for every IOCDS (A0, A1, A2, and A3 IOCDSs).

LINECOUN (65)
specifies that IOCP should print 65 lines of output on each page of a configuration report.

DISK
specifies that IOCP should send its output to disk storage.

NOTERM
specifies that IOCP should not display any diagnostic messages at the terminal.

Return Codes

When you run the VM version of IOCP, IOCP returns one of the following codes at the completion of the job:

Return Code (Decimal)	Description and Action
0	IOCP has completed the requested function without error, and may have sent one or more informational messages. If so, the informational messages in the output listings or the reports describe the specific conditions.
2	IOCP has completed the requested functions without error but has sent one or more caution messages. The caution messages in the output listings or the reports describe the specific conditions.
4	IOCP has completed the requested functions without error but has sent one or more warning messages. The warning messages in the output listings or the reports describe the specific conditions.
8	IOCP has encountered an error and has ended processing before completing the requested function. The error message in the output listing describes the specific condition.
12	IOCP has ended because the output data set DCB failed to open. IOCP was unable to print messages or reports. Ensure that the FILEDEF command for the output data set is correct. You may query the data definitions for all files by issuing the CMS FILEDEF command without operands.
16	IOCP has ended because it could not obtain enough storage. To determine the necessary amount of storage, see “IOCP Storage Requirements” on page 4-3. Define more virtual storage, perform an IPL of CMS, and send the IOCP command again.

In addition to the return codes listed, the CMS-IOCP interface module, DMSICP, sends its own error messages with corresponding return codes for each message. For the return codes generated with error messages, see “IOCP Messages (DMSICP Prefix)” on page 8-54.

Methods of Running the VM Version of IOCP

This topic suggests ways the installation can run the VM version of IOCP to:

1. Initially define and validate the I/O configuration data for a new processor
2. Subsequently redefine and replace the I/O configuration on an installed CPC.

Initial Definition of I/O Configuration Data

Before installing the CPC, you can create an IOCP input file on an existing system. The service representative uses this input file during the installation of the new CPC unless you are upgrading a CPC and were able to write an IOCDS in preparation of the upgrade. To prepare an input file, follow these steps:

1. Determine, from your physical plan, the I/O configuration requirements that must be met to install the CPC.
2. Prepare an input file of IOCP statements that define your I/O configuration and system requirements. The service representative will use this file when installing the CPC. For a sample input file containing IOCP statements, see Figure B-1 on page B-1.
3. Check the IOCP statement input by running the IOCP command under CMS. Code ICP and NOWRTCDS in the IOCP command. This command allows you to check the syntax of the IOCP statements as well as to check the configuration reports for the desired configuration data.

Note: When you perform an initial program load (IPL) of VM, VM creates its software I/O configuration by sensing the devices in the hardware I/O configuration. If all the devices return all of the information VM needs, VM completes its software I/O configuration. If not, you must specify this information in the system configuration file or the obsolete real I/O configuration file and it should correspond to the information you code in the IOCP statements. Figure B-2 on page B-1 contains sample SYSTEM CONFIG statements that correspond to some of the IOCP statements in Figure B-1 on page B-1. Figure B-3 on page B-2 contains a sample HCPRIO file that corresponds to the sample IOCP input file shown in Figure B-1 on page B-1.

4. If there are any errors in the IOCP statements, correct the errors and rerun IOCP (Step 3 on page 4-12).
5. Analyze the IOCP configuration reports (produced in Step 3 on page 4-12) to ensure that the desired I/O configuration is defined. If necessary, revise the IOCP statements and rerun IOCP.
6. If you are upgrading to a CPC whose SYSTEM= value supports IOCDS generation option NOCHKCPC, write the IOCDS for the new CPC on your current CPC using NOCHKCPC. See "Machine Rules" on page F-2 to determine which CPCs can write an IOCDS in preparation for an upgrade and which CPCs can have an IOCDS written to them by ICP IOCP. This is the preferred method for writing the initial IOCDS when upgrading a CPC. Inform the service representative which IOCDS should be used after the upgrade. Skip Step 7.

   If you are upgrading to a CPC whose SYSTEM= value does not support parameter NOCHKCPC or this is a new installation, continue with Step 7.
7. Download the input file to diskette. If the file is too big to fit on a diskette, compress it using a zip compatible program. Source from a diskette must be in DOS file format or have been compressed.

   Note: During the physical installation of the CPC, the service representative uses your validated input file (with the stand-alone version of IOCP) to configure and test the I/O configuration for the new CPC. See "Creating a New IOCDS in a New Central Processor Complex (CPC)" on page 6-8 for an example using the stand-alone version of IOCP

Redefinition and Replacement of I/O Configuration Data

The following steps describe how your installation can replace the existing I/O configuration data on a CPC:

1. Update the input file that contains the IOCP statements to reflect your new I/O configuration. Figure B-1 on page B-1 contains a listing of a typical IOCP input file.
2. Run the VM version of IOCP to check the input file you updated in Step 1. Use the ICP and NOWRTCDS options in the CMS IOCP command.
3. Correct any errors in the IOCP statements and rerun IOCP (Step 2).
4. Analyze the IOCP configuration reports (produced in Step 2) to ensure that the desired I/O configuration is defined. If necessary, revise the IOCP statements and rerun IOCP (Step 2).
5. Run the IOCP program by issuing the IOCP command with a write option WRTA*x*. This option writes the I/O configuration to the specified IOCDS on the support element. All users must have privilege class C to write. You must have privilege class B if you specify IOCP utility option DYN.

Note: Continue with Steps 6-11 when you wish to use the new IOCDS created in Step 5. Perform these steps at a convenient time, because they disrupt installation operations.

6. If necessary, revise the system configuration file or the real I/O configuration file to reflect the changes made by IOCP. The real I/O configuration file is HCPRIO. The system configuration file is SYSTEM CONFIG.

   Figure B-2 on page B-1 contains sample SYSTEM CONFIG statements that correspond to some of the IOCP statements in Figure B-1 on page B-1. Figure B-3 on page B-2 contains a sample HCPRIO list that corresponds to the IOCP list in Figure B-1 on page B-1.
7. Generate the new VM system.
8. Shut down VM.
9. Perform a power-on reset of the CPC with the new IOCDS specified as the source of your configuration data. Use **Disable Write Protection** under **Options** on the Input/Output Configuration panel.
10. Load (IPL) VM.
11. Test the new configuration. Follow the procedures established for your site.
12. Save the file you used in Step 2 on page 4-13 to provide a backup.

Chapter 5. Running the VSE Version of IOCP

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In This Chapter

This chapter describes the following:

- General information
- IOCP storage requirements
- JCL statements required to run IOCP functions (with examples)
- Return codes IOCP can set
- Methods you can follow to initially define the I/O configuration or to redefine an existing I/O configuration.

General Information

The VSE version of the input/output configuration program (IOCP) runs as a job under control of VSE/ESA or z/VSE. The IOCP program name is ICPIOCP. By running ICPIOCP, you can verify IOCP input statements for CPCs that require the ICP version of IOCP. See Table F-3 on page F-5 to determine the CPCs that require ICPIOCP.

In VSE, use JCL statements to run IOCP. In the EXEC statement, code options in the PARM keyword to override IOCP defaults. Use VSE to direct IOCP to do the following:

- Generate an IOCDS:
  - Read, validate, and check the syntax of input statements
  - Generate an IOCDS based on the configuration defined in the statements
  - Produce reports of the IOCDS
  - When requested, write the generated IOCDS to the support element hard disk.
- Produce configuration reports:
  - Read one or more IOCDSs from the support element hard disk
  - Print IOCP configuration reports (see Chapter 7, “IOCP Configuration Reports”).

IOCP Storage Requirements

IOCP uses a variable amount of storage based on the type of IOCDS it is processing. Use a partition size of 73MB to ensure sufficient space for the job. However, to determine the specific IOCP storage requirements for your CPC, see Table F-3 on page F-5.

Coding the JCL EXEC Statement for Generating an IOCDS

In the EXEC statement, code the name of the IOCP program in the PGM parameter and code the following PARM options to generate an IOCDS. (The examples later in this chapter describe the JOB and ASSGN statements for an IOCP job.)

Note: PARM parameter defaults allow you to generate an IOCDS and to produce reports. However, the defaults do not allow you to write to the support element hard disk.

```
PARM='WRTCDS=Ax|NO,LINECOUNT=n,CHECKCPC=YES|NO'
```

WRTCDS
specifies whether IOCP writes an IOCDS to the support element hard disk. All WRTCDS options except NO cause IOCP to write an IOCDS. You can write an IOCDS only from an authorized logical partition (that is, I/O Configuration Control Authority is enabled).

Note: If you run VSE as a guest under VM, writing an IOCDS is not supported.

IOCP writes the IOCDS only if:

- No errors are encountered during IOCP processing
- The system operator grants permission in response to message ICP050D
- The IOCDS is not write protected.

Request IOCP to write the IOCDS only after you have done the following:

- Checked the syntax of the input statements
- Generated an IOCDS based on the configuration defined in the statements
- Reviewed reports on the generated IOCDS
- Checked to see whether or not the generated IOCDS is correct.

To replace a write-protected IOCDS, use **Disable Write Protection** under **Options** on the Input/Output Configuration panel.

When IOCP writes an IOCDS to the support element hard disk, it overwrites the previous configuration data in that IOCDS, even if that IOCDS is the active IOCDS. (The active IOCDS is the one used for the last power-on reset.)

The valid options for WRTCDS are A*x* and NO.

A*x* specifies that IOCP should write the A*x* IOCDS (where *x* is 0, 1, 2, or 3) to the support element hard disk.

NO
specifies that IOCP does not write the IOCDS to the support element hard disk.

NO is the default if you do not code WRTCDS.

Code or use the default WRTCDS=NO when you test the input file and do not want to write to the support element hard disk until you have successfully tested and checked the input file.

Also, you must code or use the default WRTCDS=NO when you run IOCP on a CPC that does not require the IOCP this user's guide describes. However, certain CPCs allow you to write an IOCDS in anticipation of supporting ICP IOCP.

LINECOUNT=*n*
specifies the number of lines that IOCP prints on a page of the IOCP output listing and configuration reports, including the heading of the report. Code a decimal value in the range of 20-99.

If you do not specify LINECOUNT, use the equivalent VSE command SET LINECT=*n*.

CHECKCPC=

YES
specifies that IOCP generate an IOCDS as follows:

- Based on the CPC on which IOCP is running if writing an IOCDS. IOCP ignores the SYSTEM= keyword on the ID statement if specified.
- Based on the CPC on which IOCP is running if not writing an IOCDS and the SYSTEM= keyword was not specified.
- Based on the SYSTEM= parameter if specified and IOCP is not writing an IOCDS.

YES is the default.

NO
specifies writing the IOCDS in preparation of a CPC upgrade. IOCP generates an IOCDS based on the SYSTEM= parameter on the ID statement and writes the IOCDS to the current CPC. See "Machine Rules" on page F-2 to determine which SYSTEM= parameters are valid with CHECKCPC=NO and which CPCs can have ICPIOCP write an IOCDS to them.

The IOCDS cannot be used to power-on reset the current CPC until it is upgraded to the type of CPC the IOCDS supports. For example, if IOCP generates an IOCDS for a 2084 CPC using SYSTEM=(2084,1) and writes the IOCDS to a general purpose 2064 model 1*xx*, the IOCDS cannot be used for power-on reset until the 2064 is upgraded to a 2084 model CPC.

A WRTCDS option other than NO is required. Also, the SYSTEM keyword on the ID statement must be specified.

Attention: Use CHECKCPC=NO only in preparation of a CPC upgrade. After the upgrade, IBM recommends that you write an IOCDS using CHECKCPC=YES at your earliest convenience. This prevents the possibility of using the initial IOCDS for a second upgrade to a CPC which won't support the IOCDS and will fail power-on reset.

LPAR=

YES
specifies that the generated IOCDS is for a CPC operating in LPAR mode. Although LPAR=YES is currently accepted, IOCP will disallow it in the future.

JCL Examples of Generating an IOCDS

Example 1

The following example shows the JCL statements to check an IOCP input file imbedded in the job. IOCP requires SYSLST for the output data set and sends reports there.

```
// JOB   IOCP1
// ASSGN SYSLST,cuu
// ON $RC GE 8 GOTO $EOJ
// EXEC  PGM=ICPIOCP,SIZE=AUTO
(Imbed your IOCP input statements here)
/*
/&
```

In the example:

JOB
specifies the JOB statement.

SYSLST
specifies the printer to receive messages and reports. You must assign SYSLST

to a physical printer or to a VSE/POWER™ spooled printer. (Note that IOCP records contain ANSI device control characters and have a length of 133 bytes.)

ON $RC GE 8 GOTO $EOJ
specifies that if IOCP ends with an error (return code of 8 or greater), job processing ends.

EXEC
specifies the EXEC statement with the following options coded:

PGM=ICPIOCP
specifies that you want to run the ICPIOCP program.

SIZE=AUTO
specifies that the IOCP program should use the remaining partition size for GETVIS.

Example 2

This example shows the JCL statements used to do the following:

- Check an input file
- Generate an IOCDS
- Write the generated IOCDS to the A0 IOCDS slot on the support element.

IOCP requires SYSLST for the output data set and sends reports there.

```
// JOB   IOCP2
// ASSGN SYSLST,cuu
// ON $RC GE 8 GOTO label
// EXEC  PGM=ICPIOCP,SIZE=AUTO,PARM='WRTCDS=A0.
* $$ SLI ICCF=(membername),LIB=(lib)
/*
/. label
/&
```

In the example:

JOB
specifies the JOB statement.

SYSLST
specifies the printer to receive messages and reports. You must assign SYSLST to a physical printer or to a VSE/POWER spooled printer. (Note that IOCP records contain ANSI device control characters and have a length of 133 bytes.)

ON $RC GE 8 GOTO *label*
specifies that if IOCP ends with an error (return code of 8 or greater), job processing continues at *label*.

EXEC
specifies the EXEC statement with the following options coded:

PGM=ICPIOCP
specifies that you want to run the ICPIOCP program.

SIZE=AUTO
specifies that the IOCP program should use the remaining partition size for GETVIS.

PARM='WRTCDS=A0'
specifies that IOCP write the A0 IOCDS to the support element hard disk.

ICCF=(*membername***)**
specifies the name of the IOCP source member of a VSE/ICCF library.

LIB=(lib)
specifies the name of the VSE/ICCF-controlled library to search for the named SLI member.

Example 3

The following example shows the JCL statements to check an IOCP input file. IOCP requires SYSLST for the output data set and sends reports there.

```
// JOB   IOCP1
// ASSGN SYSLST,cuu
// ASSGN SYSIPT,cuu
// ON $RC GE 8 GOTO $EOJ
// EXEC  PGM=ICPIOCP,SIZE=AUTO
/*
/&
```

In the example:

JOB
specifies the JOB statement.

SYSLST
specifies the printer to receive messages and reports. You must assign SYSLST to a physical printer or to a VSE/POWER spooled printer. (Note that IOCP records contain ANSI device control characters and have a length of 133 bytes.)

SYSIPT
specifies the device that contains the input data set, which consists of statements with a record length of 80 bytes. You can assign SYSIPT to a disk, tape, or card reader.

ON $RC GE 8 GOTO $EOJ
specifies that if IOCP ends with an error (return code of 8 or greater), job processing ends.

EXEC
specifies the EXEC statement with the following options coded:

PGM=ICPIOCP
specifies that you want to run the ICPIOCP program.

SIZE=AUTO
specifies that the IOCP program should use the remaining partition size for GETVIS.

Coding the JCL EXEC Statement for Producing Configuration Reports

In the EXEC statement, code the name of the IOCP program in the PGM parameter and the following PARM options to produce configuration reports. (The example later in this chapter describes the JOB and ASSGN statements for an IOCP job.)

You must code the REPORT option to receive reports of an IOCDS.

```
PARM='REPORT=Ax,LINECOUNT=n'
```

REPORT=
specifies that IOCP should read one or more IOCDSs from the support element hard disk to produce configuration reports. You can code more than one REPORT option. If you code only one option, you can omit the parentheses.

Notes:

1. If you run VSE as a guest under VM, REPORT is not supported.
2. You cannot use ICPIOCP to produce reports for IOCDSs produced by the IYP, IZP, or IXP versions of IOCP.
3. You can read an IOCDS only from an authorized logical partition (that is, I/O Configuration Control Authority is enabled).

The valid options for REPORT are A*x* and A.

A*x* specifies the A*x* IOCDS, where *x* is 0, 1, 2, or 3.

A specifies all the A*x* IOCDSs. See Appendix F, "Machine Limits and Rules" to determine the A*x*IOCDSs your CPC supports.

LINECOUNT=*n*
specifies the number of lines that IOCP prints on a page of the IOCP output listing and configuration reports, including the heading of the report. Code a decimal value in the range of 20-99.

If you do not use LINECOUNT, use the equivalent VSE command `SET LINECT=n`.

Conditions for Coding the REPORT Option

Code REPORT to apply to the following conditions:

- Use it only for IOCDSs written with ICPIOCP to avoid IOCP ending with an error.
- Use it in the absence of the WRTCDS and CHECKCPC options. You cannot read an input file and generate an IOCDS (which includes reports of the generated IOCDS), and produce reports by means of the REPORT option in the same job.
- Code several REPORT options; IOCP supports redundant or duplicate REPORT values. For example, REPORT=(A0,A1,A2,A3) is the same as REPORT=A. Regardless of the order in which you specify the options, IOCP produces reports in the following order: A0, A1, A2, A3.

JCL Example of Producing Configuration Reports

This example shows the JCL statements to produce IOCP reports of all the A*x* IOCDSs read from the support element hard disk. IOCP requires SYSLST for the output data set. It sends reports to SYSLST. You do not need an ASSGN statement to access an IOCDS from the support element hard disk.

```
// JOB   IOCP2
// ASSGN SYSLST,cuu
// EXEC PGM=ICPIOCP,SIZE=AUTO,PARM='REPORT=A'
```

In the example:

JOB
specifies the JOB statement.

SYSLST
specifies the printer to receive messages and reports. You must assign SYSLST to a physical printer or to a VSE/POWER spooled printer. (Note that IOCP records contain ANSI device control characters and have a length of 133 bytes.)

EXEC
specifies the EXEC statement with the following options coded:

PGM=ICPIOCP
specifies that you want to run the ICPIOCP program.

SIZE=AUTO
specifies that the IOCP program should use the remaining partition size for GETVIS.

PARM='REPORT=A'
specifies that IOCP should read all the A*x* IOCDSs from the support element hard disk to produce reports.

Return Codes

When you run the VSE version of IOCP, it returns one of the following codes at the completion of the job:

Return Codes		
Decimal	**Hex**	**Description and Action**
0	0	IOCP has completed the requested function without error and may have sent one or more informational messages. If so, the informational messages in the output listings or the reports describe the specific conditions.
2	2	IOCP has completed the requested function without error but has issued one or more caution messages. The caution messages in the output listings or the reports describe the specific conditions.
4	4	IOCP has completed the requested function without error but has issued one or more warning messages. The warning messages in the output listings or the reports describe the specific conditions.
8	8	IOCP has encountered an error and has ended processing before completing the requested function. The error message in the output listing describes the specific condition.
16	10	IOCP has ended because it could not obtain the needed storage by means of the GETVIS statement. To determine the partition size to use, see "IOCP Storage Requirements" on page 5-2.

Methods of Running the VSE Version of IOCP

This topic suggests the steps that you can use to run the VSE version of IOCP to do the following:

- Define and check the I/O configuration data to prepare for a new CPC
- Redefine and replace an I/O configuration on an installed CPC.

Initial Definition of I/O Configuration Data

The following example describes the steps that you can use to initially define and check the I/O configuration data to prepare for the installation of a new CPC. The example suggests that you develop a card-image input file (consisting of IOCP statements) and check the input file on an existing system. The service representative uses this input file to generate the I/O configuration data during the installation of the new CPC unless you are upgrading a CPC and were able to write an IOCDS in preparation of the upgrade. Use this input deck to generate new I/O configuration data after making changes to your I/O configuration.

1. Determine, from your physical plan, the I/O configuration requirements that you must meet to install the CPC.

2. Prepare an input file (containing IOCP statements) that defines your I/O configuration. Using this file, run IOCP as described in the following steps. (Appendix B, “Lists of Statement Input” shows a list of a typical IOCP input file containing IOCP statements.)
3. Run IOCP by means of JCL statements to validate the IOCP statements.

   In the PARM parameter of the EXEC statement, use the WRTCDS=NO option. This option allows you to check the syntax of the IOCP statements and to check the configuration reports for the desired configuration data.
4. If there are any errors in the IOCP statements, correct the errors and rerun IOCP (Step 3).
5. Analyze the IOCP configuration reports (produced in Step 3) to ensure that you have defined the desired I/O configuration. If necessary, revise the IOCP statements and rerun IOCP.
6. If you are upgrading to a CPC whose SYSTEM= value supports execution parameter CHECKCPC=NO, write the IOCDS for the new CPC on your current CPC using CHECKCPC=NO. See “Machine Rules” on page F-2 to determine which CPCs can write an IOCDS in preparation for an upgrade and which CPCs can have ICPIOCP write an IOCDS to them. Inform the service representative which IOCDS should be used after the upgrade. This is the preferred method for writing the initial IOCDS when upgrading a CPC. Skip Step 7.

   If you are upgrading to a CPC whose SYSTEM=*value* does not support execution parameter CHECKCPC=NO or if this is a new installation, continue with Step 7.
7. To save the validated input file the service representative to use during installation of the CPC, download the input file to diskette. If the file is too big to fit on a diskette, compress it using a zip compatible program. Source from a diskette must be in DOS file format or must have been compressed.

   Note: During the physical installation of the CPC, the service representative uses your validated input file (with a stand-alone version of IOCP) to configure and test the I/O configuration for the new CPC. See “Creating a New IOCDS in a New Central Processor Complex (CPC)” on page 6-8 for an example using the stand-alone version of IOCP.

Redefinition and Replacement of I/O Configuration Data

The following example describes the steps you can use to replace the existing I/O configuration data on a CPC. Use this procedure when the I/O configuration for the CPC changes and you need to run IOCP.

1. Update your IOCP input file to reflect your new I/O configuration.
2. Run IOCP by means of JCL statements to validate the IOCP statements you updated in Step 1. In the PARM parameter of the EXEC statement, use the WRTCDS=NO option.
3. If there are any errors in the IOCP statements, correct the errors and rerun IOCP (Step 2).
4. Analyze the IOCP configuration reports (produced in Step 2) to ensure that you have defined the desired I/O configuration. If necessary, revise the IOCP statements and rerun IOCP (Step 2).
5. Run IOCP using JCL statements that specify a write option (WRTCDS=A*x*). IOCP writes the specified IOCDS to the support element hard disk. The system operator must respond YES to IOCP message ICP050D before IOCP writes to the support element hard disk.

6. Update your VSE IPL procedure ($IPL...) to reflect the changes you made to the IOCP input file.
7. Perform a power-on reset of the CPC with the appropriate IOCDS specified as the source of your configuration data. Use **Disable Write Protection** under **Options** on the Input/Output Configuration panel to remove write protection.
8. Test the new configuration.

Chapter 6. Running the Stand-Alone Version of IOCP

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In This Chapter

The following information is an overview of the stand-alone version of the input/output configuration program (IOCP). A separate document, *Stand-Alone IOCP User's Guide*, SB10-7040, provides detailed instructions for using IOCP.

General Information

The stand-alone version of IOCP is shipped with the CPC as part of the Licensed Internal Code. Run the stand-alone version of IOCP to define the I/O configuration to the CPC before an operating system version of IOCP is installed.

The stand-alone program uses the object-action user interface and is designed for use with a keyboard or a mouse. If you are not familiar with using an object-oriented user interface, see "Related Documents" on page xx for the Stand-Alone IOCP User's Guide appropriate to your system.

The stand-alone version of IOCP allows you to save the IOCDS source file to the support element (SE) hard disk.

IOCDS source files on the SE hard disk can contain only 256,000 card records. Twenty additional records are reserved for IOCP messages. If the selected IOCP function includes writing the IOCDS source file to the SE and the file is too big, IOCP removes IOCP messages from the file to reduce its size until it is small enough to be written.

The stand-alone version of IOCP must be run in a logical partition that was activated with a minimum of 128MB (MB equals 1 048 576 bytes) of storage.

The stand-alone version of IOCP removes any comment card that begins with ***ICP** or ***IYP**. Stand-alone IOCP uses ***ICP** comments for IOCP messages. When you generate an IOCDS, stand-alone IOCP removes these IOCP messages so that the resultant IOCDS source file only contains IOCP messages from the selected function.

The stand-alone version of IOCP does not have I/O recovery capability. I/O error conditions cause IOCP to terminate.

Generating an Input/Output Configuration Data Set

The CPC requires specific data about all attached control units and I/O devices. A text file must be created to supply this information to the CPC. This file can be provided on diskette or transferred from an FTP location to IOCP. If necessary, for a diskette, the file can be compressed using a zip compatible program. IOCP loads this data into the CPC and builds the IOCDS.

Note: The stand-alone version of IOCP is needed **only**:

- When you generate (**Build** action) an IOCDS during initial installation.
- If your operating system does not have a batch version of IOCP.

Creating an IOCDS Source File for a New Central Processor Complex (CPC)

All IOCDS source data consists of RESOURCE, CHPID, CNTLUNIT, and IODEVICE statements. All logical partitions, channel paths, control units, and I/O

devices must be defined in the IOCDS source file to generate an IOCDS, which can then be used to perform power-on reset of the CPC.

You should create an IOCDS source file as part of the installation procedure for a new CPC.

Use the text editor of your choice to create a file with the statements for the logical partitions, channel paths (*chpids*), control units, and I/O devices.

- The format and syntax of the IOCP statements are explained in detail in Chapter 2, "IOCP Statements and Functions."
- Refer to Appendix D, "List of I/O Devices and Control Units" for specific control unit and device information.
- Examples of IOCP statements are in *Stand-Alone IOCP User's Guide*, SB10-7032 and Appendix E, "Configuration Examples."

To create IOCP input statements:

1. Create a drawing of the physical arrangement of control units and attached devices to show all channel connections. You can use your own floor plan or some other source. It is much easier to be certain you have included all of the I/O devices on your system in the IOCP statements when you can see where all of the devices are. For more information on floor plans, see the *Installation Manual for Physical Planning* for your processor (for example, for zSeries 990, see the *zSeries 990 Installation Manual for Physical Planning*, GC28-6824).
2. Enter the statements. Use Chapter 2, "IOCP Statements and Functions" and Appendix D, "List of I/O Devices and Control Units" for specific information, and observe the following tips:
   - Enter the ID statement first. The first eight characters of the MSG1 parameter are the IOCDS name displayed on the Hardware Management Console when the IOCDS is built. Make certain the SYSTEM parameter matches your system.
   - Enter the RESOURCE statement. Define each logical partition and logical channel subsystem.
   - Enter the CHPID statements. Define each physical channel path installed on your system.
   - Enter the CNTLUNIT statements. It is very important to match the PROTOCL and UNITADD parameters with the values set in each control unit by the system installer.
   - Enter the IODEVICE statements.

After completing the input, save the edited file and exit the editor.

Use another CPC running an operating system version of IOCP (z/OS, VM, or VSE) to verify the card-image input statements for this IOCDS source file. If you do not have access to an operating system version of IOCP capable of verifying an IOCDS source file, ask your service representative to verify the IOCDS source for you.

If you are upgrading to a CPC whose SYSTEM= value supports execution parameter CHECKCPC=NO, write the IOCDS for the new CPC on your current CPC using CHECKCPC=NO. See "Machine Rules" on page F-2 to determine which CPCs can write an IOCDS in preparation for an upgrade and which CPCs can have an IOCDS written to them by ICP IOCP. Inform the service representative which IOCDS should be used after the upgrade.

If you are not upgrading or cannot write an IOCDS in preparation for the upgrade, use a utility available to your personal computer and operating system to download the IOCDS source file to diskette. Source from a diskette must be in DOS file format or have been compressed using a zip compatible program. **The IOCDS source file you create must be available to the new CPC installer at the time the new CPC is installed.** Instead of a diskette, you can import an uncompressed IOCP source file to the SE from an FTP location.

Starting the Program

Start and control the stand-alone version of IOCP from the Hardware Management Console or SE console. The CPC must be powered-on and a logical partition must be activated to build a new IOCDS. Begin the I/O configuration procedure as follows:

- From the Support Element Workplace panel, open **Task List** from **Views**.
- Open **CPC Configuration** tasks.
- Open **Groups** from **Views**.
- Open **Images** from **Groups Work Area**
- Select an activated logical partition image icon in the **Groups Work Area**. The logical partition must be activated with I/O Configuration Control Authority enabled through its activation profile.
- Drag the image icon (using the right mouse button) and drop it on the **Input/Output (I/O) Configuration** task.

Input/Output Configuration Panel

The Input/Output Configuration panel is the starting point for all of the stand-alone IOCP functions.

You can select a particular configuration to work with from this panel or see the status of each configuration. This panel, found in the *Stand-Alone IOCP User's Guide* for your CPC, shows that there are four IOCDSs identified as A0-A3, and these have names that you supply.

The fifth IOCDS, D0, is a diagnostic IOCDS. D0 cannot be altered. It is intended for service personnel to use, with the following possible exception. If you could not perform a power-on reset and activate a logical partition in ESA/390 mode using any of the A0-A3 IOCDSs, D0 could be used to perform the power-on reset. I/O cannot be accessed after a D0 power-on reset.

The Input/Output Configuration panel and the **Options** and **View** actions are all explained in the *Stand-Alone IOCP User's Guide* (see "Related Documents" on page xx). The Input/Output Configuration panel provides access to all of the information about the IOCDSs currently available on the CPC, and the functions under **Options** permit you to make changes to that information.

The Input/Output Configuration panel displays the following information:

Data Set
This is a 2-character identifier for the IOCDS. There are five IOCDSs (A0, A1, A2, A3 and D0).

Name The 8-character name is the identification of the IOCDS. The name comes

from the first eight characters that you have entered in the MSG1= keyword in the ID statement. The displayed name is saved from the IOCDS when it is written to the support element.

Write Protected
A **NO** indicates that the IOCDS is not write-protected. A **YES** indicates that the IOCDS is write-protected. Write-protection prevents batch IOCP or stand-alone IOCP from overwriting the IOCDS.

Date Month, day, and year when the IOCDS was built.

Time Hour and minute when the IOCDS was built. (Displayed in 24-hour format).

Data Set Status
Can be one of the following:

Valid Means the IOCDS is usable for power-on-reset purposes. Its content matches the source only if the source status is Verified or Warnings.

Invalid
Means the IOCDS is not usable for power-on reset purposes. Either IOCP is currently writing to the IOCDS or the IOCDS was written in preparation for a CPC upgrade and will be unusable until the CPC is upgraded to the type of CPC the IOCDS supports.

Active Means this IOCDS was used during the most recent power-on reset or was selected by a dynamic activation from the SCP. Only one IOCDS can be active at a given time. The active IOCDS is made write-protected by the support element during POR with the IOCDS or after a dynamic activation by the SCP.

Source Status
Can be one of the following:

Verified
Means the stand-alone IOCP Build was processed with the source for the selected IOCDS and was successful with no warnings or errors.

Warnings
Means the stand-alone IOCP Build was processed with the source for the selected IOCDS and was successful with one or more warnings or cautions.

Errors Means the stand-alone IOCP Build was processed with the source for the selected IOCDS and was not successful. There was a terminal error.

Note: No IOCDS is written and the IOCDS remains as it was before the build.

Modified
Modified means the source for the selected IOCDS has been changed by editing the file. This also indicates that the source may not match the current IOCDS.

Imported
Means the source file was overlaid by an import.

Empty
Means the source for the selected IOCDS has been deleted or was erased when a batch IOCP program wrote the IOCDS.

Version
Number that identifies which version of IOCP was used to create the IOCDS.

IOCP Options

The list of actions appears when you click **Options** on the Input/Output Configuration panel.

You can select the action to be performed by clicking with the mouse or using the cursor movement and Enter keys.

Some of the option actions (**Enable/Disable Write Protection**, **Open Source File**, **Copy Configuration**, **Import Source File**, **Export Source File**, and **Delete Source File**) are performed using the Hardware Management Console or support element console and do not require you to run stand-alone IOCP.

However, the **Build Data Set**, **Disassemble Data Set**, and **Print Data Set Report** actions automatically start stand-alone IOCP and run it on the CPC. When one of these functions is selected, you receive a warning stating that any CPC program or operating system running in the selected logical partition will shut down to allow stand-alone IOCP to perform these functions.

Following is a brief overview of each **Options** action. For detailed descriptions of these actions, see “Related Documents” on page xx for the Stand-Alone IOCP User’s Guide appropriate for your system.

Overview of Options

Enable/Disable Write Protection
Enable protects the IOCDS and the IOCP source file on the hard disk from being overwritten. **Disable** resets the overwrite protection.

Copy Configuration
Copies one IOCDS to another. You might do this to duplicate an existing I/O configuration so you can test some changes on the copy. Both the IOCDS source file and the IOCDS are copied.

Open Source File
Calls an editor to modify the IOCDS source file card-image data for the selected configuration or to create new card-image data. (See “Creating a New IOCDS in a New Central Processor Complex (CPC)” on page 6-8).

Import Source File
Transfers the card image input to the CPC support element (SE) hard disk from a diskette in the Hardware Management Console’s 3.5-inch A-drive or from an FTP location. The IOCDS source file can then be edited and used to build an IOCDS. If you are importing from diskette, IOCDS source files must be in DOS file format or have been compressed using a zip compatible program.

Export Source File
Transfers the card-image IOCDS source file from the CPC support element hard disk to the Hardware Management Console’s A-drive or to an FTP location.

Delete Source File

Erases the IOCDS source file and replaces it with a minimum default template file. Only the source file is deleted. The IOCDS file is not deleted.

Note: Use this action with extreme care, because the IOCDS source file for the selected IOCDS will be erased. A backup of the IOCDS source file (using the **Export** action) prior to performing a delete is recommended.

Build Data Set

Does the following:

- Processes the IOCDS source file for the selected IOCDS.
- Checks the syntax and validates the configuration.
- Generates an IOCDS and, if there are no errors, writes the IOCDS to the CPC support element hard disk.
- Writes the IOCDS source file to the CPC support element hard disk with any IOCP messages embedded in the file.

Disassemble Data Set

Generates card-image statements (IOCDS source file) from an IOCDS on the CPC support element hard disk and writes an IOCDS source file. The new IOCDS source file contains the full I/O configuration and is the logical equivalent of the original IOCDS source file.

Print Data Set Report

Allows a formatted report of the IOCDS to be printed or written to tape.

Cancel

Leaves the I/O Configuration Program.

IOCP View Actions

The **View** actions let you see what is actually written in the selected IOCDS. The information displayed using **View** is read directly from the IOCDS, not the IOCDS source file. Because both control unit and device information are displayed on a per-channel basis, you must select the channel (CHPID) to be displayed.

Methods of Running the Stand-Alone Version of IOCP

Following are descriptions of various ways to run the stand-alone version of IOCP.

Before system installation, the service representative must find out if the IOCDS source file has been previously prepared for use during installation. If you are upgrading a CPC and an IOCDS was written in preparation of the upgrade, use that IOCDS. Otherwise, a new IOCDS needs to be written.

If the IOCDS source file has been previously prepared, then it must be imported to the CPC support element. The IOCDS source file can be on a 3.5-inch diskette (DOS format or compressed file) or a location that can be accessed through FTP (uncompressed text file).

If no IOCDS or IOCDS source file is available, then it must be created at the time of installation. Use the editor supplied with the stand-alone I/O Configuration program to create the IOCDS source file.

If a default or old IOCDS source file already exists, you can use the **Delete** source file action to clear the file or use the editor actions to **Mark** and **Delete** the default or existing statements in the selected IOCDS source file rather than create a new one.

Run the stand-alone version of IOCP to:

- **Create a new IOCDS** during the installation of a new CPC if the IOCDS source file is not available.
- **Update an IOCDS** on an existing CPC, using the **Open Source File** action. In some cases where the IOCDS source file was not saved or if you are unsure of the IOCDS source file, you can select the **Disassemble Data Set** action to get an equivalent IOCDS source file from an existing IOCDS.
- **Replace an IOCDS** (using **Import** *and* **Build**) in a CPC if the IOCDS source file is available on a diskette.

Starter IOCDS Information for the Stand-Alone Version of IOCP

There are four IOCDSs available to you. Four starter IOCDSs are shipped with the machine, as well as a diagnostic IOCDS that service representatives use. The starter IOCDSs are provided as examples only and are not intended to provide a match of the customer's actual I/O configuration. You can view the contents of the starter IOCDSs by using any action under **View** or the **Open Source File** action under **Options** on the Input/Output Configuration panel.

Creating a New IOCDS in a New Central Processor Complex (CPC)

All IOCDS source files consist of RESOURCE, CHPID, CNTLUNIT, and IODEVICE statements. All logical partitions, paths, control units, and I/O devices must be defined in the IOCDS source file to generate an IOCDS, which can then be used to power-on reset the CPC.

You should perform the steps that create an IOCP source file as part of the installation procedure for a new CPC.

The following example assumes that the IOCDS source file must be entered from scratch. All of the logical partitions, I/O channel paths, control units, and installed device unit addresses must be defined and available to the service representative. When the new IOCDS source file is created, it will define the initial I/O configuration for the new CPC. Comments will be saved.

To **create** a new IOCDS for a new CPC complex:

1. Perform a power-on reset of the system with the D0 IOCDS and activate a logical partition
2. Select the **I/O Configuration** panel. See "Starting the Program" on page 6-4.
3. Select the IOCDS to create.
4. Use the **Delete Source File** action under **Options** on the Input/Output Configuration panel to remove the existing IOCDS source file for the selected configuration. (If there is a default or example IOCDS source file, the service representative should check with the IOCDS source file owner to determine if it should be saved by using the **Export Source File** action to move the IOCDS source file to a diskette).
5. Enter the statements for the logical partitions, channel paths (*chpids*), control units, and I/O devices.
   - The format and syntax of the IOCP statements are explained in detail in Chapter 2, "IOCP Statements and Functions."

- Refer to Appendix D, “List of I/O Devices and Control Units” for specific control unit and device information.
- Examples of IOCP statements are in Appendix E, “Configuration Examples.”

To create an IOCDS source file:

a. Use a drawing of the physical arrangement of control units and attached devices to show all channel connections. This drawing could be from your own floor plan or some other source. It is much easier to be certain you have included all of the I/O devices on your system in the IOCP statements when you can see where all of the devices are. For more information on floor plans, see the *Installation Manual for Physical Planning* for your processor (for example, for zSeries 990, see the *zSeries 990 Installation Manual for Physical Planning*, GC28-6824).

b. Enter the statements. Use Chapter 2, “IOCP Statements and Functions” and Appendix D, “List of I/O Devices and Control Units” for specific information, and observe the following tips:
   - Enter the ID statement first. The first eight characters of the MSG1 parameter are the IOCDS name displayed on the Hardware Management Console when the IOCDS is built. Make certain the SYSTEM parameter matches your system.
   - Enter the RESOURCE statement. Define all logical partitions and logical channel subsystems.
   - Enter the CHPID statements. Define each physical channel path installed on your system.
   - Enter the CNTLUNIT statements. It is very important to match the PROTOCL and UNITADD parameters with the values set in each control unit by the system installer.
   - Enter the IODEVICE statements.

After completing the input, save the edited IOCDS source file and exit the editor.

6. Select the **Build Data Set** action to generate the system IOCDS. When successfully completed, the IOCDS is written to the CPC support element hard disk. If the build is not successful, IOCP error and warning messages are inserted in the card-image statements, and a copy of the IOCDS source file is saved on the CPC support element hard disk. Return to the editor to correct the errors.
7. Exit the I/O Configuration panel.
8. Perform a power-on reset of the system with the IOCDS written in Step 6. Select the newly-created IOCDS and the appropriate system mode in the power-on reset panel.

Updating an IOCDS Using the Card-Image Input Editor

This procedure describes how to update the I/O configuration data in an IOCDS for an installed CPC.

To ***update*** the I/O configuration for a CPC:

1. Ensure that the CPC is in a power-on-reset state with an appropriate existing IOCDS.
2. Select the **I/O Configuration** panel. See “Starting the Program” on page 6-4.
3. Select the IOCDS to update.
4. Check to see if the IOCDS source file matches the contents of the IOCDS. (The source status will be **Verified** or **Warnings**, and the IOCDS status will be **Valid** when the IOCDS was built from the IOCDS source file). If the status for

the IOCDS source file and the IOCDS do not match, then the IOCDS source file for the selected IOCDS may be different than the IOCDS source file used to create the IOCDS. The IOCDS source file may have been imported from diskette or it may have been modified using the editor. A reconstructed IOCDS source file can be recreated by selecting the **Disassemble Data Set** action. The **Disassemble Data Set** action reads the selected IOCDS and creates an equivalent to the IOCDS source file used to create the IOCDS.

5. If you are adding (or deleting) I/O from your configuration, update (**Open Source File**) the IOCDS source file to reflect any new I/O configured in the CPC.
6. Prepare the system line printer or channel-attached tape drive if you want printed output. The printer must be initialized (the print/forms buffer must be loaded).
7. Select the **Build Data Set** action under **Options** on the Input/Output Configuration panel.
   a. Select the appropriate parameters and press Enter.

      During the build, IOCP reads the input statements, saves them as card-image data in storage, checks the syntax, validates it, and generates an IOCDS. It produces configuration reports of the IOCDS generated. (See Chapter 2, “IOCP Statements and Functions” for more details.)

      IOCP displays messages to give the status of the IOCDS build.

   b. An error message is displayed if IOCP has detected errors in the IOCDS source file. To correct the errors, use **Open Source File** under **Options** on the Input/Output Configuration panel after the completion pop-up message.

      Errors IOCP detects are displayed in the editor. Errors are displayed in the form of IOCP comments that begin with *ICP in column 1, followed by the error message number and the message text. See Chapter 8, “IOCP Messages” for an explanation of the error messages. Correct the errors in the IOCDS source file. It is not necessary to remove the error messages from the file. IOCP will remove the messages when no errors are detected on subsequent builds.
8. View the generated IOCDS content using the **View** action (**Control Unit Information** and **Device Information** panels) or analyze the configuration reports produced in Step 7a to ensure that the desired I/O configuration has been generated. If the IOCDS source file needs to be changed, use the editor to modify the IOCDS source file on the Hardware Management Console and return to the **Build Data Set** process (Step 7).
9. If the input file is correct, and the build complete, the IOCDS now resides on the CPC support element hard disk.
10. Export the IOCDS source file to provide a backup if editing was done on the Hardware Management Console or SE console.
11. Exit IOCP by selecting the **Cancel** action on any IOCP panel.

    The I/O configuration data in the new A*x* IOCDS now contains your new configuration. Selecting a power-on reset, with A*x* as the IOCDS parameter, activates the new configuration and makes the A*x* IOCDS the configuration that the I/O subsystem uses to control I/O requests. Select the IOCDS and the system mode on the power-on reset panel.
12. Test the new configuration following the procedures established for your installation.

Notes:

1. If you change the hardware configuration with the stand-alone version of IOCP and you use a z/OS system, or if you use a VM system with which you’ve

chosen to use HCM and HCD, you should make the same changes using HCM or HCD and rewrite the IOCDS before performing the power-on reset. This action ensures consistency between the software and hardware configurations and allows the CPC to be capable of dynamic I/O configuration.

2. If you change the hardware configuration with the stand-alone version of IOCP and you use a VM system but do not use HCM and HCD, make any appropriate changes to the VM system before performing the power-on reset. If VM cannot sense all the device changes in the hardware configuration during initial program load (IPL), modify the real I/O configuration file and regenerate your operating system, or modify the system configuration file and re-IPL your operating system. These actions ensure consistency between the software and hardware configurations. (The real I/O configuration file is HCPRIO. The system configuration file is SYSTEM CONFIG.)

   For a CPC capable of dynamic I/O configuration, you must rewrite the IOCDS from VM using the DYN option and perform a power-on reset.
3. For a VSE system, if you change the hardware configuration with the stand-alone version of IOCP, you should update your software configuration to reflect the changes (modify the ASI Procedure file). This ensures consistency between the software and hardware configurations.

Description of a Stand-Alone Build of an IOCDS

IOCP performs the following steps when you specify that you want to generate or build an IOCDS using the **Build data set** action.

1. The CPC support element resets the logical partition.
2. The CPC support element loads stand-alone IOCP into processor storage for the targeted logical partition and starts the program.
3. IOCP reads the IOCDS source file from the CPC support element hard disk.

   Note: IOCP code Steps 4-5 are repeated for each input statement.
4. IOCP checks the syntax of each statement for correct format. If a syntax error is found (such as a missing parenthesis), IOCP inserts an error message in the IOCDS source file following the statement that contains the error. IOCP stops checking the syntax of a statement when it encounters the first syntax error on that statement. Therefore, if there are two or more syntax errors on a single statement, the second and following errors are found on subsequent runs of IOCP.

   If IOCP finds an error in Step 4, it performs Steps 4 and Step 5 for the remainder of the statements and then continues with Step 9 on page 6-12.
5. IOCP checks the validity of each statement. For example, IOCP checks that a CNTLUNIT statement has specified a channel path that has been previously defined in a CHPID statement. If an error is found, IOCP inserts an error message in the IOCDS source file following the statement that contains the error.

   If IOCP finds an error in Step 5, IOCP returns to Step 4, and performs only Steps 4 and 5 for the remainder of the statements and then continues with Step 9 on page 6-12.
6. After all of the input statements have been processed, IOCP generates the IOCDS and makes additional checks. For example, IOCP checks that the maximum number of control unit headers is not exceeded. If IOCP finds an error, IOCP issues an error message to the Hardware Management Console.
7. IOCP produces IOCP configuration reports of the IOCDS.

8. IOCP writes the IOCDS to the CPC support element hard disk if no errors were found.
9. IOCP writes the IOCDS source file to the CPC support element hard disk. If the build was successful, then the IOCDS source file has any previous error messages removed. If errors were detected, they are embedded in the IOCDS source file.
10. The Hardware Management Console or SE console ends the IOCP program. (Note that starting up stand-alone IOCP after this point will cause IOCP to timeout and put the logical partition in a B20 hard wait state.)

IOCP Wait State Codes

Enabled Wait States

When you run the stand-alone version of IOCP, the central processor enters many enabled wait states (PSW bit 7 is on). These are normal conditions while IOCP waits for the support element to respond to IOCP requests such as a read or write of an IOCDS. You can either wait for the support element to finish or select the Cancel button on the window and restart IOCP at a later time.

Disabled Wait States

Disabled Wait States When you run the stand-alone version of IOCP, IOCP sends the following disabled wait state codes when the indicated conditions occur.

Note: z/OS, VM, and VSE versions of IOCP do not send wait state codes.

B20

Explanation: The operator who is running the stand-alone version of IOCP has started IOCP processing after the IOCP function has completed, or IOCP was unable to read from the support element the selected function to perform.

Operator Response: If IOCP completed the selected function, no action is required. Otherwise, notify your system programmer.

Problem Determination: If IOCP did not complete the selected function, save all associated output. Contact the service representative.

B21

Explanation: A program-check interruption has occurred during processing of the stand-alone version of IOCP.

Operator Response: Notify your system programmer.

Problem Determination: Save all associated output. Call your service representative.

B22

Explanation: A machine-check interruption has occurred during processing of the stand-alone version of IOCP.

Operator Response: Notify your system programmer.

Problem Determination: Save all associated output. Call your service representative.

B23

Explanation: An uncorrectable I/O error has occurred during processing of the stand-alone version of IOCP.

Operator Response: Notify your system programmer.

Problem Determination: Save all associated output. Call your service representative.

B24

Explanation: During processing of the stand-alone version of IOCP, IOCP has encountered an error in the support element and cannot communicate with the person operating IOCP.

Operator Response: Notify your system programmer.

Problem Determination: Save all associated output. Call your service representative.

Chapter 7. IOCP Configuration Reports

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In This Chapter

This chapter describes the IOCP configuration reports. Use the reports to check the I/O configuration data in an IOCDS. Following is a brief description of each configuration report with references to report examples. If you have any comments about the IOCP reports, see “How to Send Your Comments” on page xxiv.

Configuration Report Headings

Seven heading lines appear for each configuration report. Line 1 shows:

- Time and date IOCP produced the reports.
- IOCP version and release number of the IOCP release producing the reports Type of configuration report (IOCDS TOTALS, PARTITION, PCHID SUMMARY, CHPID SUMMARY, I/O DEVICE, or CHANNEL PATH).
- Report page number.

Line 2 shows:

- Version and release of IOCP that wrote the IOCDS when the source of the report is an IOCDS from the support element hard disk.
- Blank line if the source of the report is card input; the version and release are not shown.

Line 3 shows:

- Source of the report, which can be card input, an IOCDS from the support element hard disk, or screen input (stand-alone editor).
- Whether the IOCDS was ever modified by the stand-alone editor (YES or NO).
- CHECKCPC=NO if you specified this keyword in the PARM parameter of the EXEC statement or CMS option NOCHKCPC to write an IOCDS in preparation of an upgrade.

Line 4 (ID1=) shows:

- Any identification information that you specified with the MSG1 parameter in the ID statement. (The first eight characters of ID1= are the same as the customer name of the IOCDS that appears on the I/O Configuration panel of the support element.)
- The time and date IOCP last wrote the IOCDS for a report source that is an IOCDS from the support element hard disk.

Line 5 (ID2=) shows:

- Any additional identification information that you specified with the MSG2 parameter of the ID statement.
- The support element (SE) time stamp when the report source is an IOCDS from the SE hard disk. (The SE time stamp also appears on the I/O Configuration panel of the support element.)

Line 6 (SYSTEM=) shows:

- The SYSTEM keyword value used by IOCP to determine which machine limits and rules to enforce.
- Whether IOCP performs a deck verification, attempts to write an IOCDS, or reports on an IOCDS from the support element hard disk.
- A warning if you are reporting on an IOCDS that was written to your CPC when the CPC was represented by a different SYSTEM keyword value than the one that currently represents it. For example, you have upgraded your CPC and a

different SYSTEM keyword value now represents it. Do not use this IOCDS for power-on reset unless the I/O configuration for your current CPC is identical to the configuration in the IOCDS.

Line 7 (DYNAMIC INFO:) shows:

- Any dynamic I/O configuration information associated with the IOCP source input or an IOCDS that supports dynamic I/O configuration.
- IOCDS IS NOT DYNAMIC CAPABLE if IOCDS does not support dynamic I/O configuration.
- For the IOCDS TOTALS report, the DYNAMIC INFO line is reported on line 8 and line 7 is blank.

IOCDS Totals Report

The IOCDS Totals Report lists the configuration totals in the IOCDS. Three groupings of IOCDS totals are shown.

- Channel paths and physical control units
- CHPIDs and control unit headers for each CSS ID
- Devices for each subchannel set in each CSS ID.

Figure 7-1 on page 7-4 shows an example of the IOCDS Totals Report.

If an IOCDS supports dynamic I/O configuration, the MAXDEV keyword specified on the RESOURCE statement is shown.

Each grouping of IOCDS totals includes a column for MAX ALLOWED which is the maximum number allowed for your CPC. For channel paths, the report column is always N/A. For devices for an IOCDS that supports dynamic I/O configuration, the maximum number allowed is based on the MAXDEV keyword values specified on the RESOURCE statement.

Each grouping of IOCDS totals includes a column for DYNAMIC SPARES. If an IOCDS supports dynamic I/O configuration, this column shows the number of extra units that can be dynamically added to the configuration before exceeding the maximum number allowed. For channel paths, the report column is always N/A. If an IOCDS does not support dynamic I/O configuration, the report column is N/A for all totals.

IOCP lists informational message ICP069I at the end of this report when IOCP selects a non-zero default MAXDEV value.

A legend appears at the end of the report that indicates which MAX ALLOWED column entries for devices are the result of IOCP's selecting the default MAXDEV value or a value of MIN or MAX being specified.

Sample IOCDS Totals Report

```
TIME 14.56 DATE 05.124                  REPORT BY ICP IOCP VERSION 1 RELEASE 3.0              IOCDS TOTALS REPORT      PAGE 003

                                 REPORT SOURCE IS CARD INPUT,   MODIFIED BY SCREEN INPUT=NO
ID1=SYSTEM1
ID2=HCDI.IODF02.PROD - 2005-05-04 13:54
SYSTEM=(2094,1) USED BY IOCP FOR DECK VERIFICATION

DYNAMIC INFO: PROC1    05-05-04 13:54:42 HCDI     IODF02

MAXDEV=((CSS(0),49152,MAX),(CSS(1),MIN),(CSS(3),65000,12288))


 TOTALS FOR CHANNEL PATHS AND PHYSICAL CONTROL UNITS:
 ____________________________________________________

                               IOCDS     MAX     DYNAMIC
                               TOTAL   ALLOWED   SPARES
                               _____   _______   _______

    CHANNEL PATHS ----------     19      N/A       N/A
    PHYSICAL CONTROL UNITS -      9     8192      8183


 TOTALS FOR CHPIDS AND CONTROL UNIT HEADERS:
 ___________________________________________

                      CONTROL UNIT HEADERS
                     IOCDS    MAX    DYNAMIC
    CSS   CHPIDS     TOTAL  ALLOWED  SPARES
    ___   ______     _____________________

     0      11          6    4096     4090
     1       9          6    4096     4090
     3       4          3    4096     4093


 TOTALS FOR DEVICES:
 ___________________

               SUBCHANNEL SET 0              SUBCHANNEL SET 1
          IOCDS     MAX         DYNAMIC   IOCDS     MAX         DYNAMIC
    CSS   TOTAL   ALLOWED       SPARES    TOTAL   ALLOWED       SPARES
    ___   ____________________________    ____________________________

     0      207    49152         48945       64    65535 (MAX)  65471
     1      241      241 (MIN)       0        0        0 (***)      0
     3      224    65000         64776       64    12288         12224


 LEGEND FOR MAX ALLOWED DEVICES FIELD:
 _____________________________________

    (***) - INDICATES THAT MAXIMUM NUMBER OF DEVICES ALLOWED VALUE WAS NOT SPECIFIED ON MAXDEV KEYWORD AND IS A DEFAULT
    (MIN) - INDICATES THAT MAXDEV KEYWORD VALUE WAS SPECIFIED AS 'MIN' AND THEREFORE THE MAXIMUM NUMBER OF DEVICES ALLOWED
            EQUALS THE NUMBER OF DEFINED DEVICES (IOCDS TOTAL)
    (MAX) - INDICATES THAT MAXDEV KEYWORD VALUE WAS SPECIFIED AS 'MAX' AND THEREFORE THE MAXIMUM NUMBER OF DEVICES ALLOWED
            EQUALS THE MAXIMUM NUMBER SUPPORTED BY THE CPC
```

Figure 7-1. Sample IOCDS Totals Report

Partition Report

The Partition Report lists the MIF image IDs (MIF IDs) defined in each CSS in the IOCDS and the logical partition names to which they correspond. Undefined MIF image IDs are not shown. The report also lists all I/O cluster names (IOCLUSTER keyword) and the CSSs to which they have access. Figure 7-2 on page 7-5 shows an example of a Partition Report.

Sample Partition Report

```
TIME 12.55 DATE 03.107                  REPORT BY ICP IOCP VERSION 1 RELEASE 1.0                  PARTITION REPORT      PAGE 004

                                  REPORT SOURCE IS CARD INPUT,   MODIFIED BY SCREEN INPUT=NO
ID1=SYSTEM1
ID2=HCDI.IODF02.PROD - 2003-05-31 13:54
SYSTEM=(2084,1) USED BY IOCP FOR DECK VERIFICATION
DYNAMIC INFO: PROC1    03-05-31 13:54:42 HCDI     IODF02


       MIF  PARTITION
       ID     NAME
       ___  ________

CSS 0:
        1   BBBBB
        2   LP0A
        3   AAAAAAAA
        4   LP0B
        5   LP0C
        6   LP0D
        7   LP01
        8   LP02
        9   LP03
        A   LP04
        B   LP05
        C   LP06
        D   LP07
        E   LP08
        F   LP09

CSS 1:
        1   SYS1
        2   LP12
        4   CCCCCCC
        5   LP15
        8   LP18
        B   CF1
        F   LP1F


I/O CLUSTER  CSS NUMBERS
   NAME       |0|1|2|3|
____________   ________

 SYSPLEX1     | |1| | |
```

Figure 7-2. Sample Partition Report

PCHID Summary Report

The Physical Channel Identifier (PCHID) Summary Report lists the PCHIDs defined in the IOCDS as well as the channel paths that cannot have PCHIDs. The report does not include channel paths that require a PCHID when an IOCDS is written and for which no PCHID has been defined. It includes channel paths that cannot have a PCHID at the bottom of the report. For each channel path, the report shows the following:

- PCHID number associated with the channel path
- CHPID number of the channel path
- Channel path type
- Switch number associated with the channel path
- CSS IDs to which the channel path has access
- Any configuration discrepancy or comment for the channel path.

Figure 7-3 on page 7-7 shows an example of the PCHID Summary Report.

If the PCHID keyword is not allowed for the channel path type, N/A appears in the report column. If the report was produced for a deck verification and channel paths that require the PCHID keyword did not specify PCHID, the channel paths are excluded from the report and a warning line is printed at the end of the report. PCHIDs associated with different card slots are separated by a blank line.

If the SWITCH keyword is not allowed for the channel path type, N/A appears in the report column. If the SWITCH keyword is allowed but not specified for a channel path, then NONE appears.

The CHANNEL CONFIGURATION DISCREPANCY OR COMMENT report column indicates whether or not a channel path has a configuration discrepancy. The report column also displays a comment for certain channel path types when the channel path does not have a configuration discrepancy. **NO** indicates no configuration discrepancy. **YES** indicates that a configuration discrepancy exists and is accompanied by a description of the discrepancy. More than one configuration discrepancy can exist for a channel path but only one discrepancy is reported.

Channel configuration discrepancies are conditions that should not exist on your CPC. Because IOCP processes channel paths in ascending PCHID number order, it assumes that the lower numbered PCHIDs are accurate and reports discrepancies against the higher numbered PCHIDs. An IOCDS is produced but IOCP reports the discrepancies so that they can be corrected. For an explanation of the channel configuration rules for your CPC, see Appendix F, “Machine Limits and Rules.”

If no configuration discrepancy exists, a comment is displayed for certain channel path types. Channel path types that support a maximum number of valid subchannels (for example, FCP and OSD) display the current number of valid subchannels defined on the channel path. For OSN channel paths, the OSN and 3745 subchannel totals are both displayed. For IQD channel paths, the number of subchannels defined on the channel path and the total number of subchannels for all IQD channel paths in the configuration are both displayed. For more information on the maximum subchannels supported for a channel path type, see Appendix F, “Machine Limits and Rules,” on page F-1.

The following channel configuration discrepancies can exist for a channel path:

YES - It exceeds max number of FICON+OSA | CF Hardware | ISC-3 | CFS+CFR | CBS+CBR | CFP | CBP | ICP | OSA channel paths allowed.
This indicates that the channel path type has exceeded the maximum number of channel paths allowed for your CPC for the indicated channel hardware type. This discrepancy exists for all higher numbered channel paths of the same channel hardware type.

In addition to the Channel Configuration Discrepancy report column, IOCP prints an informational line after a channel path that has certain discrepancies. These informational lines are as follows:

```
PCHID xxx | CHPID xx in CSS y has exceeded the maximum number of FICON+OSA |
CF Hardware | ISC-3 | CFS+CFR | CBS+CBR | CFP | CBP | ICP | OSA channel
paths allowed by your processor.
```

The following channel path types are associated with the aforementioned channel hardware types:

- FICON+OSA = FC, FCV, FCP, OSC, OSD, OSE, and OSN
- CF Hardware = CFS, CFR, CFP, CBS, CBR, and CBP
- ISC-3 = CFS, CFR, and CFP

- CFS+CFR = CFS and CFR
- CBS+CBR = CBS and CBR
- OSA = OSC, OSD, OSE, and OSN

IOCP lists caution message ICP055I at the end of this report when any channel configuration discrepancies exist.

At the end of the PCHID Summary Report, the totals are listed for each channel card type. The totals for the internal channel path types are also included.

Sample PCHID Summary Report

```
TIME 14.56 DATE 05.124                  REPORT BY ICP IOCP VERSION 1 RELEASE 3.0              PCHID SUMMARY REPORT      PAGE 005

                                  REPORT SOURCE IS CARD INPUT,   MODIFIED BY SCREEN INPUT=NO
ID1=SYSTEM1
ID2=HCDI.IODF02.PROD - 2005-05-04 13:54
SYSTEM=(2094,1) USED BY IOCP FOR DECK VERIFICATION
DYNAMIC INFO: PROC1    05-05-04 13:54:42 HCDI     IODF02

                              CSS NUMBERS
PCHID  CHPID  TYPE  SWITCH   |0|1|2|3|   CHANNEL CONFIGURATION DISCREPANCY OR COMMENT
_____  _____  ____  ______   _________   ____________________________________________________________

 100     10   CVC    NONE    |0| | | |   NO
 101     11   CNC    NONE    |0| | | |   NO
 102     10   CTC    NONE    | |1| | |   NO
 103     12   CVC    NONE    |0| | | |   NO
 104     13   CNC     25     |0| | | |   NO
 105     41   CNC    NONE    | |1| | |   NO
 106     18   CNC    NONE    |0| | | |   NO
 107     19   CNC    NONE    |0| | | |   NO

 140     40   FCV     25     | |1| | |   NO
 141     21   FC      35     | |1| | |   NO

 160     30   OSD    N/A     |0| | | |   NO  - SUBCHANNELS =  240
 161     31   OSN    N/A     | | | |3|   NO  - SUBCHANNELS =  192 (OSN),  48 (3745)

 180     20   CNC     25     | |1| | |   NO

 380     80   FCV     45     | | | |3|   NO
 381     90   FCV     36     | | | |3|   NO

 N/A     FE   IQD    N/A     |0|1| | |   NO  - SUBCHANNELS =   192, TOTAL =   592
 N/A     FF   IQD    N/A     |0|1| |3|   NO  - SUBCHANNELS =   400, TOTAL =   592
 N/A     FC   ICP    N/A     |0|1| | |   NO
 N/A     FD   ICP    N/A     |0|1| | |   NO


 TOTALS FOR CHANNEL CARD TYPES:
 ______________________________

        ESCON              FICON             ISC               ICB               OSA             INTERNAL
   CBY  CVC  CNC  CTC     FC  FCV  FCP     CFS  CFR  CFP     CBS  CBR  CBP     OSC  OSD  OSE  OSN     ICP  IQD
   ___  ___  ___  ___     __  ___  ___     ___  ___  ___     ___  ___  ___     ___  ___  ___  ___     ___  ___
     0    2    6    1      1    3    0       0    0    0       0    0    0       0    1    0    1       2    2
```

Figure 7-3. Sample PCHID Summary Report

Channel Path Identifier (CHPID) Summary Report

The Channel Path Identifier (CHPID) Summary Reports list the channel path identifiers defined in each CSS in the IOCDS. The report name in the heading states which CSS is being reported and to which CSS the CHPID numbers belong. Every defined CSS is reported separately. For each CHPID, the report shows the following:

- CHPID number of the channel path

- PCHID number associated with the channel path
- Channel path type
- Switch number associated with the channel path
- Channel path parameter (CHPARM)
- Logical partition (LP) access method for the channel path
- MIF image ID numbers of logical partitions that the channel path can access.

Figure 7-4 on page 7-9 shows an example of the CHPID Summary Report.

If the SWITCH keyword is not allowed for the channel path type, N/A appears in the report column. If the SWITCH keyword is allowed but not specified for a channel path, then NONE appears.

If the CHPARM keyword is not allowed for the channel path type, N/A appears in the report column. If CHPARM is allowed but not specified or has a value of 00, either NONE or 00 is shown depending on the channel path type.

The LP ACCESS report column shows the logical partition access method for the channel path.

- DED is reported if the channel path is dedicated to a single logical partition
- REC is reported if the channel path is defined as reconfigurable
- SHARED is reported if the channel path is defined as shared
- SPANNED is reported if the channel path is defined as spanned.

The MIF IMAGE ID NUMBERS report column shows the MIF image IDs of logical partitions that the CHPID can access in the CSS.

- For each partition in the CHPID's access list, an 'A' appears in the MIF image ID number column for the corresponding partition.
- For each partition in the CHPID's candidate list but not in the CHPID's access list, a 'C' appears in the MIF image ID number column for the corresponding partition.
- For all partitions not in the CHPID's access or candidate lists, the corresponding MIF image ID number columns are left blank.

Several legends appear at the end of the CHPID Summary Report. The first set of legends describe the entries in the CHPARM report column for the channel path types that support the CHPARM keyword. The last legend describes the entries in the MIF IMAGE ID NUMBERS report column.

At the end of the CHPID Summary Report, the totals are listed for each channel path type in the CSS.

Sample CHPID Summary Report

```
TIME 14.56 DATE 05.124                    REPORT BY ICP IOCP VERSION 1 RELEASE 3.0        CSS 0: CHPID SUMMARY REPORT      PAGE 006

                                  REPORT SOURCE IS CARD INPUT,   MODIFIED BY SCREEN INPUT=NO
ID1=SYSTEM1
ID2=HCDI.IODF02.PROD - 2005-05-04 13:54
SYSTEM=(2094,1) USED BY IOCP FOR DECK VERIFICATION
DYNAMIC INFO: PROC1    05-05-04 13:54:42 HCDI     IODF02

                                        LP          MIF IMAGE ID NUMBERS
CHPID  PCHID  TYPE  SWITCH  CHPARM  ACCESS   |1|2|3|4|5|6|7|8|9|A|B|C|D|E|F|
_____  _____  ____  ______  ______  _______  _______________________________

  10    100   CVC    NONE    N/A    REC      |C|C|C|C|A|C|C|C|C|C|C|C|C|C|C|
  11    101   CNC    NONE    NONE   SHARED   |C|C|C|C|C|A|A|C|C|C|C|C|C|C|C|
  12    103   CVC    NONE    N/A    DED      | | | | | |A| | | | | | | | | |
  13    104   CNC     25     NONE   SHARED   |A|A|A|A|A|A|A|A|A|A|A|A|A|A|A|
  18    106   CNC    NONE    NONE   SHARED   |A|A|A|A|A|A|A|A|A|A|A|A|A|A|A|
  19    107   CNC    NONE    NONE   SHARED   |A|A|A|A|A|A|A|A|A|A|A|A|A|A|A|
  30    160   OSD    N/A      00    SHARED   |A|A|A|A|A|A|A|A|A|A|A|A|A|A|A|
  FC    N/A   ICP    N/A     N/A    SPANNED  |A|A|A|A|A|A|A|A|A|A|A|A|A|A|A|
  FD    N/A   ICP    N/A     N/A    SPANNED  |A|A|A|A|A|A|A|A|A|A|A|A|A|A|A|
  FE    N/A   IQD    N/A      00    SPANNED  |C|A| | | | |A| | |A|C| | | | |
  FF    N/A   IQD    N/A      00    SPANNED  |A|A|A|A|A|A|A|A|A|A|A|A|A|A|A|

 LEGEND FOR CHPARM FIELD FOR CHANNEL TYPES CNC, FCV, AND FC:
 ___________________________________________________________

    01 - CHANNEL IS MANAGED BY DYNAMIC CHPID MANAGEMENT

 LEGEND FOR CHPARM FIELD FOR CHANNEL TYPE OSD:
 _____________________________________________

    00 - MAXIMUM OF 160 IP STACKS AND 480 SUBCHANNELS
    02 - GREATER THAN 160 IP STACKS AND 480 SUBCHANNELS

 LEGEND FOR CHPARM FIELD FOR CHANNEL TYPE IQD:
 _____________________________________________

    00 - 8K  MTU AND 16K FRAME SIZE
    40 - 16K MTU AND 24K FRAME SIZE
    80 - 32K MTU AND 40K FRAME SIZE
    C0 - 56K MTU AND 64K FRAME SIZE

 LEGEND FOR MIF IMAGE ID NUMBERS FIELD:
 ______________________________________

    A     - PARTITION IN CHPID'S ACCESS AND CANDIDATE LISTS
    C     - PARTITION IN CHPID'S CANDIDATE LIST ONLY
    BLANK - PARTITION NOT IN CHPID'S ACCESS OR CANDIDATE LIST


 TOTALS FOR CHPIDS FOR CSS 0:
 ____________________________

    PARALLEL        ESCON       FICON          COUPLING FACILITY                 NETWORK / QDIO
    CBY  CVC     CNC  CTC  FCV     FC     CFS  CFR  CFP  CBS  CBR  CBP  ICP     OSC  OSD  OSE  OSN  IQD  FCP
    ___  ___     ___  ___  ___     __     ___  ___  ___  ___  ___  ___  ___     ___  ___  ___  ___  ___  ___
      0    2       4    0    0      0       0    0    0    0    0    0    2       0    1    0    0    2    0
```

Figure 7-4. Sample CHPID Summary Report (Part 1 of 2)

```
TIME 14.56 DATE 05.124                  REPORT BY ICP IOCP VERSION 1 RELEASE 3.0        CSS 1: CHPID SUMMARY REPORT      PAGE 007

                                REPORT SOURCE IS CARD INPUT,   MODIFIED BY SCREEN INPUT=NO
ID1=SYSTEM1
ID2=HCDI.IODF02.PROD - 2005-05-04 13:54
SYSTEM=(2094,1) USED BY IOCP FOR DECK VERIFICATION
DYNAMIC INFO: PROC1    05-05-04 13:54:42 HCDI     IODF02

                                        LP          MIF IMAGE ID NUMBERS
CHPID  PCHID  TYPE  SWITCH  CHPARM  ACCESS   |1|2|3|4|5|6|7|8|9|A|B|C|D|E|F|
-----  -----  ----  ------  ------  -------  -------------------------------

  10    102   CTC    NONE    N/A    SHARED   | | | | |A| | |A| | | | | | |
  20    180   CNC     25      01    SHARED   |C|C| |C|C| | |C| | |C| | |C|
  21    141   FC      35    NONE    SHARED   |A| | | |A| | |A| | | | | | |
  40    140   FCV     25    NONE    SHARED   |A|A| |A|A| | |A| | |A| | | |A|
  41    105   CNC    NONE   NONE    SHARED   |A|A| |A|A| | |A| | |A| | | |A|
  FC    N/A   ICP    N/A    N/A     SPANNED  |A|A| |A|A| | |A| | |A| | | |A|
  FD    N/A   ICP    N/A    N/A     SPANNED  |A|A| |A|A| | |A| | |A| | | |A|
  FE    N/A   IQD    N/A     00     SPANNED  |C|A| |C|C| | |A| | |C| | | |C|
  FF    N/A   IQD    N/A     00     SPANNED  |A|A| |A|A| | |A| | |A| | | |A|


 LEGEND FOR CHPARM FIELD FOR CHANNEL TYPES CNC, FCV, AND FC:
 ----------------------------------------------------------

    01 - CHANNEL IS MANAGED BY DYNAMIC CHPID MANAGEMENT


 LEGEND FOR CHPARM FIELD FOR CHANNEL TYPE OSD:
 --------------------------------------------

    00 - MAXIMUM OF 160 IP STACKS AND 480 SUBCHANNELS
    02 - GREATER THAN 160 IP STACKS AND 480 SUBCHANNELS

 LEGEND FOR MIF IMAGE ID NUMBERS FIELD:
 -------------------------------------

    A     - PARTITION IN CHPID'S ACCESS AND CANDIDATE LISTS
    C     - PARTITION IN CHPID'S CANDIDATE LIST ONLY
    BLANK - PARTITION NOT IN CHPID'S ACCESS OR CANDIDATE LIST


 TOTALS FOR CHPIDS FOR CSS 1:
 ----------------------------

    PARALLEL         ESCON       FICON          COUPLING FACILITY                NETWORK / QDIO
    CBY  CVC     CNC  CTC  FCV     FC     CFS  CFR  CFP  CBS  CBR  CBP  ICP     OSC  OSD  OSE  OSN  IQD  FCP
    ---  ---     ---  ---  ---     --     ---  ---  ---  ---  ---  ---  ---     ---  ---  ---  ---  ---  ---
      0    0       2    1    1      1       0    0    0    0    0    0    2       0    0    0    0    2    0

 LEGEND FOR CHPARM FIELD FOR CHANNEL TYPE IQD:
 --------------------------------------------

    00 - 8K  MTU AND 16K FRAME SIZE
    40 - 16K MTU AND 24K FRAME SIZE
    80 - 32K MTU AND 40K FRAME SIZE
    C0 - 56K MTU AND 64K FRAME SIZE
```

Figure 7-4. Sample CHPID Summary Report (Part 2 of 2)

I/O Device Report

The I/O Device Report lists the I/O devices defined in the IOCDS. Devices are reported by the type of control unit to which they attach. Within a group of devices that attach to the same type of control unit, devices are sorted by device number. All the devices defined by the same IODEVICE statement are reported together. For each IODEVICE statement, the report shows the following:

- Device numbers of the devices
- Subchannel set IDs in which the devices are defined
- Unit address of the devices
- Device type and model
- CSS IDs to which the devices have access
- Physical control unit numbers associated with the CSS ID and to which the devices are attached
- Paths that attach to the physical control unit

- Switch number associated with the channel path
- MIF image ID numbers of logical partitions which the channel path can access
- Any comments for the devices.

Figure 7-5 on page 7-13 shows an example of the I/O Device Report.

If a device is in subchannel set 1 for a CSS, '(1)' is displayed in the DEVICE NUMBERS report column for the appropriate CSSs. For devices in subchannel set 0 for a CSS, no special indication is displayed.

The path listed is the composite path that the processor uses when communicating with the device. This composite path (*chpid.link.cuadd*) includes the channel path, the link address, and the control unit logical address. If you do not specify LINK but you do specify CUADD, two asterisks (**) are displayed for LINK. If a control unit is managed (PATH keyword on CNTLUNIT statement), two asterisks (**) are displayed for the path.

If the SWITCH keyword is not allowed for the channel path type, N/A appears in the report column. If the SWITCH keyword is allowed but not specified for a channel path, then NONE appears. If the control unit path is a managed path (PATH keyword on CNTLUNIT statement), YES appears in the report column.

The MIF IMAGE ID NUMBERS report column shows the MIF image ID numbers of logical partitions which the channel path can access. The following is reported:

- For each partition in the channel path's access list, an 'A' appears in the MIF image ID column for the corresponding partition.
- For each partition in the channel path's candidate list but not in the channel path's access list, a 'C' appears in the MIF image ID column for the corresponding partition.
- For all partitions not in the channel path's access or candidate lists, the corresponding MIF image ID columns are left blank.

The PART, PARTITION, or NOTPART keyword in the IODEVICE statement allows you to define a device candidate list that includes or excludes LP access at the device level. The following is reported in the MIF IMAGE ID NUMBERS report column for a device candidate list:

- For the first report line for a device, an asterisk (*) appears in the MIF image ID column for each partition in the device candidate list.
- A minus sign (-) for an LP indicates that the device candidate list excludes LP access to the device even though the LP has access to a channel path assigned to the device.
- A plus sign (+) for an LP indicates that the device candidate list includes LP access to the device even though the LP currently does not have access to a channel path assigned to the device. The LP can access only the device following a dynamic I/O configuration change that adds the LP to the channel path's candidate list.

Notes:

1. For each device that has a plus sign (+) in the MIF IMAGE ID NUMBERS column, ensure that you specified the correct LPs in the PARTITION or NOTPART keyword on the IODEVICE statement. The device will not have access to those LPs, even though the channel path does have access, until a dynamic I/O configuration change is made.

2. If the device has a device candidate list that is equivalent to the one it would have for a default, a plus sign (+) is not shown for LPs included in the device candidate list. A plus sign (+) is shown only if the device candidate list was specified, is not equivalent to the default one, and included an LP for which the path does not have access.

The COMMENT report column contains information that applies to the devices. The following information is reported:

- STADET if the device has value STADET=Y
- TIMEOUT if the TIMEOUT keyword is not ignored for the device and has value TIMEOUT=Y
- Protocol value if the PROTOCL keyword is not ignored for the control units attached to the device as follows:
  - DCI for PROTOCL=D
  - DS-3.0 for PROTOCL=S
  - DS-4.5 for PROTOCL=S4
- TYPE value of 1 or 2 if the SHARED keyword is not ignored for the control units attached to the device
- PREFERRED PATH if the channel path is the preferred channel path for the device
- MANAGED PATHS (*x*) if the control unit attached to the device has managed paths and where *x* is the number of managed paths in the control unit.

A legend appears at the end of the I/O Device Report. The legend describes the entries in the MIF IMAGE ID NUMBERS report column.

Sample I/O Device Report

```
TIME 14.56 DATE 05.124                  REPORT BY ICP IOCP VERSION 1 RELEASE 3.0                  I/O DEVICE REPORT      PAGE 009

                                  REPORT SOURCE IS CARD INPUT,   MODIFIED BY SCREEN INPUT=NO
ID1=SYSTEM1
ID2=HCDI.IODF02.PROD - 2005-05-04 13:54
SYSTEM=(2094,1) USED BY IOCP FOR DECK VERIFICATION
DYNAMIC INFO: PROC1    05-05-04 13:54:42 HCDI     IODF02

                                  CONTROL        PATH
 DEVICE      UNIT     DEVICE       UNIT    CHPID.LINK.CUADD            MIF IMAGE ID NUMBERS
 NUMBERS     ADDRS  TYPE-MODEL  CSS  NUMBER      |__.__.__|    SWITCH  |1|2|3|4|5|6|7|8|9|A|B|C|D|E|F|            COMMENT
_________    _____  _________  ___  _______                    ______  _______________________________  ________________________

             ******************** The following devices are assigned to control unit type CF       ********************

-------------------------------------------------------------------------------------------------------------------------------------
FFF2-FFFF     N/A   CF           0                                       |A|A|A|A|A|A|A|A|A|A|A|A|A|A|A|
                                       FFFE        FC            N/A     |A|A|A|A|A|A|A|A|A|A|A|A|A|A|A|
                                                   FD            N/A     |A|A|A|A|A|A|A|A|A|A|A|A|A|A|A|
                                 ----------------------------------------------------------------------------------------------------
                                 1                                       |A|A| |A|A| | | |A| | |A| | | |A|
                                       FFFE        FC            N/A     |A|A| |A|A| | | |A| | |A| | | |A|
                                                   FD            N/A     |A|A| |A|A| | | |A| | |A| | | |A|
-------------------------------------------------------------------------------------------------------------------------------------

             ******************** The following devices are assigned to control unit type FCTC     ********************

-------------------------------------------------------------------------------------------------------------------------------------
3000          00     FCTC         1                                       |*|*| |*|*| | |*| | |*| | | |*|  STADET
                                       800         21.635D.14     35      |A| | | |A| | |A| | | | | | |
-------------------------------------------------------------------------------------------------------------------------------------

             ******************** The following devices are assigned to control unit type OSA      ********************

-------------------------------------------------------------------------------------------------------------------------------------
2000-200F     00-0F  OSA          0                                       |*|*|*|*|*|*|*|*|*|*|*|*|*|*|*|
                                       003         30            N/A     |A|A|A|A|A|A|A|A|A|A|A|A|A|A|A|
-------------------------------------------------------------------------------------------------------------------------------------
20FE          FE     OSAD         0                                       |*|*|*|*|*|*|*|*|*|*|*|*|*|*|*|
                                       003         30            N/A     |A|A|A|A|A|A|A|A|A|A|A|A|A|A|A|
-------------------------------------------------------------------------------------------------------------------------------------

             ******************** The following devices are assigned to control unit type OSN      ********************

-------------------------------------------------------------------------------------------------------------------------------------
2801-2810     01-10  3745         3                                       |*|*|*| | | | | | | | | | | |
                                       004         31            N/A     |A|A|A| | | | | | | | | | | |
-------------------------------------------------------------------------------------------------------------------------------------
2880-28BF     80-BF  OSN          3                                       |*|*|*| | | | | | | | | | | |
                                       004         31            N/A     |A|A|A| | | | | | | | | | | |
-------------------------------------------------------------------------------------------------------------------------------------

             ******************** The following devices are assigned to control unit type SCTC     ********************

-------------------------------------------------------------------------------------------------------------------------------------
 100          00     SCTC         1                                       | | | | |*| | |*| | | | | |*|  STADET
                                       002         10            NONE    | | | | |A| | |A| | | | | |+|
-------------------------------------------------------------------------------------------------------------------------------------
 101          01     SCTC         1                                       |*|*| |*| | | |*| | |*| | | |*|  STADET
                                       002         10            NONE    |+|+| |+|-| | |A| | |+| | | |+|
-------------------------------------------------------------------------------------------------------------------------------------
```

Figure 7-5. Sample I/O Device Report (Part 1 of 2)

```
TIME 14.56 DATE 05.124                                                
```

- Logical partition (LP) access method for the channel path
- Physical control unit numbers that attach to the channel path
- Device numbers that attach to the physical control units that attach to the channel path.

For each physical control unit that attaches to each channel path, the Channel Path Report shows the following:

- Control unit number and type
- Control unit logical address (CUADD)
- Unit address ranges
- CSS IDs to which the channel path has access
- Link address.

All the devices defined by the same IODEVICE statement are reported together. For each IODEVICE statement that is assigned to each physical control unit, the Channel Path Report shows the following:

- Device numbers from the IODEVICE statement assigned to this channel path
- Subchannel set IDs in which the devices are defined
- Unit addresses for the devices
- Device type
- Model.

See Figure 7-6 on page 7-17 for an example of the Channel Path Report.

If the SWITCH keyword is not allowed for the channel path type, N/A appears in the report column. If the SWITCH keyword is allowed but not specified for a channel path, then NONE appears.

The LP ACCESS report column shows the logical partition access method for the channel path.

- DED is reported if the channel path is dedicated to a single logical partition
- REC is reported if the channel path is defined as reconfigurable
- SHARED is reported if the channel path is defined as shared
- SPANNED is reported if the channel path is defined as spanned.

If a channel path is assigned to an I/O cluster (IOCLUSTER keyword), the I/O cluster name is reported in the control unit columns.

For ICP channel paths, a CSS ID associated with the channel path and the CHPID number and CSS ID that are associated with the connected channel path are reported in the control unit columns.

If the channel path type (TYPE keyword) does not permit logical addresses (CUADD keyword) to be specified for physical control units, N/A appears in the report column. If the channel path type permits logical addresses but you did not specify any, NONE appears in the report column.

If the channel path type (TYPE keyword) does not permit link addresses (LINK keyword) to be specified for physical control units, N/A appears in the report column. If the channel path type permits link addresses but you did not specify any, two asterisks (**) appear in the report column.

If a device is in subchannel set 1 for a CSS, '(1)' is displayed in the DEVICE NUMBERS report column for the appropriate CSSs. For devices in subchannel set 0 for a CSS, no special indication is displayed.

Sample Channel Path Report

```
TIME 14.56 DATE 05.124                    REPORT BY ICP IOCP VERSION 1 RELEASE 3.0                CHANNEL PATH REPORT      PAGE 012

                                  REPORT SOURCE IS CARD INPUT,   MODIFIED BY SCREEN INPUT=NO
ID1=SYSTEM1
ID2=HCDI.IODF02.PROD - 2005-05-04 13:54
SYSTEM=(2094,1) USED BY IOCP FOR DECK VERIFICATION
DYNAMIC INFO: PROC1    05-05-04 13:54:42 HCDI     IODF02

                              LP         CONTROL UNIT        UA               DEVICE      UNIT       DEVICE
PCHID  CHPID  TYPE  SWITCH  ACCESS   NUMBER   TYPE   CUADD  RANGE  CSS  LINK  NUMBERS     ADDRS   TYPE    MODEL
_____  _____  ____  ______  _______  ______________________  _____  ___  ____  _________   _____  ______________

 100     10   CVC    NONE   REC
                                 1111   3490     N/A   20-2F   0    **
                                                                    1020-1027    20-27  3480
                                                                    1028-102F    28-2F  3480
-------------------------------------------------------------------------------------------------------------------
 101     11   CNC    NONE   SHARED
                                  044   2105       2   00-BF   0    **
                                                                     600-67F     00-7F  3390B
                                                                     680-6BF(1)  80-BF  3390A
-------------------------------------------------------------------------------------------------------------------
 102     10   CTC    NONE   SHARED
                                  002   SCTC     NONE  00-07   1    **
                                                                     100         00     SCTC
                                                                     101         01     SCTC
-------------------------------------------------------------------------------------------------------------------
 103     12   CVC    NONE   DED
                                 1111   3490     N/A   20-2F   0    **
                                                                    1020-1027    20-27  3480
                                                                    1028-102F    28-2F  3480
-------------------------------------------------------------------------------------------------------------------
 106     18   CNC    NONE   SHARED
-------------------------------------------------------------------------------------------------------------------
 140     40   FCV     25    SHARED
                                  044   2105       2   00-BF   1    C0
                                                                     600-67F     00-7F  3390B
                                                                     680-6BF     80-BF  3390A
-------------------------------------------------------------------------------------------------------------------
 141     21   FC      35    SHARED
                                  800   FCTC      14   00-07   1   635D
                                                                     3000        00     FCTC
-------------------------------------------------------------------------------------------------------------------
 160     30   OSD    N/A    SHARED
                                  003   OSA      NONE  00-FE   0   N/A
                                                                     2000-200F   00-0F  OSA
                                                                     20FE        FE     OSAD
-------------------------------------------------------------------------------------------------------------------
 180     20   CNC     25    SHARED   *** IOCLUSTER = SYSPLEX1 ***
-------------------------------------------------------------------------------------------------------------------
 N/A     FF   IQD    N/A    SPANNED
                                 F001   IQD      NONE  00-FF   0   N/A
                                                                     4300-430F   00-0F  IQD
                                                                ---------------------------------------------------
                                                                 1   N/A
                                                                     4300-430F   00-0F  IQD
                                                                ---------------------------------------------------
                                                                 3   N/A
                                                                     4300-430F   00-0F  IQD
-------------------------------------------------------------------------------------------------------------------
 N/A     FC   ICP    N/A    SPANNED  *** IS IN CSS 0 AND CONNECTS TO ICP CHPID FD IN CSS 1 ***
                                  FFFE   CF       N/A    N/A    0   N/A
                                                                     FFF2-FFFF    N/A    CF
                                                                ---------------------------------------------------
                                                                 1   N/A
                                                                     FFF2-FFFF    N/A    CF
-------------------------------------------------------------------------------------------------------------------
 N/A     FD   ICP    N/A    SPANNED  *** IS IN CSS 1 AND CONNECTS TO ICP CHPID FC IN CSS 0 ***
                                  FFFE   CF       N/A    N/A    0   N/A
                                                                     FFF2-FFFF    N/A    CF
                                                                ---------------------------------------------------
                                                                 1   N/A
                                                                     FFF2-FFFF    N/A    CF
-------------------------------------------------------------------------------------------------------------------
```

Figure 7-6. Sample Channel Path Report

Conditions for Producing Reports

The z/OS and VSE versions of IOCP produce reports, if no error occurs, as follows:

- IOCP generates an IOCDS. The reports show the configuration data in the IOCDS that is based on the input statements.
- Code the REPORT option in the PARM parameter of the EXEC statement. The reports show the configuration data contained in each IOCDS that you specified on REPORT=.

The VM version of IOCP produces reports, if no error occurs, as follows:

- IOCP generates an IOCDS in response to the CMS IOCP command with IOCDS generation options. The reports show the configuration data in the IOCDS that IOCP generates from the input statements.
- Use configuration report options (RPTA*x* or RPTA) in the CMS IOCP command. The reports show the configuration data contained in each specified IOCDS.

The stand-alone version of IOCP produces reports, if no error occurs, as follows:

- The **Send output to a printer** option was selected for the **Build data set** action. The reports show the configuration data generated by the build IOCDS process.
- The **Print data set report** action was selected. The reports show the configuration data contained in the selected IOCDS.

Chapter 8. IOCP Messages

IOCP Messages (ICP Prefix) 8-2
IOCP Messages (DMSICP Prefix) 8-54

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IOCP Messages (ICP Prefix)

This topic describes the messages produced by all versions (z/OS, VM, VSE, and stand-alone) of ICP IOCP. The messages are described in alphanumeric sequence by message identifier.

Message ICP050D is sent to the z/OS or VSE system console and requests action by the system operator. Messages ICP056I and ICP057I are sent to the z/OS or VSE system console and the output printer for the IOCP programmer. All other messages are sent to the output printer or card-image file for the IOCP programmer or to the system console for the IOCP operator.

The message format is:

`ICP`*`nnns text`*

nnn Is the message serial number.

s Is is the type code:

- **A** Action. The operator must perform a specific action.
- **D** Decision. The operator must choose an alternative.
- **I** Information. No operator action is required. Most information messages are for the IOCP programmer.
- **W** Wait. Processing stops until an action is determined and performed.

text Is the message text.

ICP000I UNDEFINED MESSAGE CODE. CODE=*xxxxxxxx* HEX

Explanation: IOCP has generated message code *xxxxxxxx* for which a message has not been defined. A logical error has occurred in IOCP.

System Action: IOCP action is unpredictable.

Programmer Response: Rerun the IOCP job. If the problem occurs again, save the console sheet and all associated output. Report the problem to your service representative.

ICP050D SHOULD *jobname* WRITE TO LEVEL A*x* IOCDS? REPLY 'YES', 'NO' OR 'CANCEL'

Explanation: A job with name *jobname* is running IOCP with a WRTCDS option other than NO in the PARM parameter of the EXEC statement. IOCP sends this message to request permission from the z/OS or VSE system operator for the job to write the A*x* IOCDS to the support element (SE) hard disk.

z/OS users can prevent this message from being sent. See "Authorizing an IOCDS Write" on page 3-3.

Note: If two (or more) jobs are allowed to update concurrently the A*x* IOCDS, the outcome could be an IOCDS that is logically inconsistent with the input from any one job. Using this IOCDS at power-on reset could produce undesirable results.

System Action: If you enter YES, the job continues running IOCP and, if no errors are encountered, replaces the input/output configuration data in the A*x* IOCDS on the support element (SE) hard disk with the input/output configuration data it generates. Use the Input/Output Configuration panel to determine if the A*x* IOCDS is write-protected.

If you enter NO, the job continues generating input/output configuration data in storage and to produce reports, but the job does not replace the input/output configuration data in the A*x* IOCDS on the SE hard disk.

If you enter CANCEL, the job ends immediately and receives system code X'222'.

Operator Response: Contact your system programmer and respond as instructed.

Programmer Response: Follow your site procedures and advise the operator.

Routing Codes: 1 and 11

Descriptor Code: 7

ICP051I IOCP VERSION *nn.nn.nnn* TERMINATED. CODE=*xx*

Explanation: IOCP version *nn.nn.nnn* has terminated for one of the following reasons:

Code	Description
01	UNKNOWN PARM KEYWORD VALUE - *yyyyyyyy*. An unknown keyword value was found beginning with the first character of string *yyyyyyyy* in the PARM parameter of the EXEC statement. (This code can result from an extra left parenthesis after the REPORT keyword.)
02	DUPLICATE PARM KEYWORD - *yyyyyyyy*. A duplicate keyword was found beginning with the first character of string *yyyyyyyy* in the PARM parameter of the EXEC statement.
03	UNKNOWN PARM KEYWORD - *yyyyyyyy*. An unknown keyword was found beginning with the first character of string *yyyyyyyy* in the PARM parameter of the EXEC statement.
04	INVALID LINECOUNT VALUE. The keyword value on the LINECOUNT keyword in the PARM parameter of the EXEC statement was not within the allowed range.
05	CONFLICTING PARM KEYWORDS. Conflicting keywords were found in the PARM parameter of the EXEC statement.
06	PARM DELIMITER ERROR - *yyyyyyyy*. An extra or missing comma was found beginning with the first character of string *yyyyyyyy* in the PARM parameter of the EXEC statement. This code can result from unbalanced parentheses around the REPORT parameters or an incorrect report keyword value.
07	One or more errors were found in the input card-image statements.
08	An error was found while IOCP was generating the IOCDS in storage.
09	A REPORT or WRTCDS option has been specified but ICP IOCP only reads or writes an IOCDS in a CPC that supports ICP IOCP. If your CPC supports ICP IOCP, the IOCP release level you used does not support your CPC; you must use an IOCP level that supports your CPC.
10	IOCP was unable to connect to the VSE facility which reads and writes an IOCDS for one of the following reasons: • The facility is in use by another job. Wait a few minutes and rerun the job. • The facility is unavailable due to a support element or VSE error. • VSE is a guest under VM. VSE does not support reading or writing an IOCDS as a guest under VM. Use the VM version of IOCP.
11	TOO MANY VM LEVELS. You attempted to read or write an IOCDS and multiple levels of VM are present. For z/OS, reading and writing an IOCDS is supported when z/OS is a guest of VM and only one level of VM is present. For VM, reading and writing an IOCDS is supported only when performed from a first-level VM.
12	IOCP was not authorized to write an IOCDS. The operator replied No to message ICP050D.
13	IOCP was not authorized to write an IOCDS. You are not authorized to update the CBD.CPC.IOCDS resource of the FACILITY class in the installed security product. (See “Authorizing an IOCDS Write” on page 3-3 for more information.)
14	PARM KEYWORD MISSING. Not all required execution keywords were specified. You specified keyword CHECKCPC=NO in the PARM parameter of the EXEC statement or CMS option NOCHKCPC to write an IOCDS in preparation of an upgrade, but you did not specify a keyword or option to write the IOCDS. You must specify a keyword value other than WRTCDS=NO or NOWRTCDS.
15	INSUFFICIENT STORAGE. IOCP could not obtain enough storage by using the GETMAIN statement (for z/OS and VM) or the GETVIS statement (for VSE).
4x	IOCP encountered an error while reading the A*x* (where *x* is 0, 1, 2, or 3) IOCDS from, or writing the Ax IOCDS to the support element hard disk. See the listing for related error messages.

System Action: If IOCP encountered an error while doing anything other than reading an IOCDS, it ends with return code 8. If IOCP encountered an error while reading an IOCDS, it ends the read operation for that IOCDS. However, IOCP will attempt to read each additional IOCDS that was specified before it ends with return code 8.

Programmer Response: Ensure that the PARM parameter of the EXEC statement is coded correctly. For support element errors, save the output listings and report the problem to the service representative.

ICP052I DCB DID NOT OPEN-SYSIN DD STATEMENT MAY BE MISSING/INVALID

Explanation: The device control block for the data set specified in the SYSIN DD statement did not open when IOCP sent the OPEN statement.

System Action: IOCP ends.

Programmer Response: Ensure that the DD statement for the SYSIN data set is valid.

ICP053I IOCP VERSION *nn.nn.nnn* FAILED. INSUFFICIENT STORAGE

Explanation: IOCP version nn.nn.nnn could not obtain enough storage by means of the GETMAIN statement (for z/OS and VM) or the GETVIS statement (for VSE). If you are reporting on multiple IOCDSs, IOCP could not obtain enough storage to report on any of the IOCDSs. IOCP performs multiple storage allocations. If the first storage request fails, only this message is sent. If the second storage request fails, other messages are sent to the output data set.

System Action: IOCP ends with a return code of 16.

Programmer Response: For z/OS users, IOCP requires a maximum of 73MB of storage. To determine the region size to use, see “IOCP Storage Requirements” on page 3-3.

For VM users, define more virtual storage, perform an IPL of CMS, and send the IOCP command again. IOCP uses a maximum of 73MB of storage in a CMS virtual machine. For more information, see “IOCP Storage Requirements” on page 4-3.

For VSE users, define a partition size of 73MB to ensure sufficient space for the job. Also, specify SIZE=AUTO on the EXEC statement of the job to allow IOCP to use the remaining partition size for GETVIS. For more information, see “IOCP Storage Requirements” on page 5-2.

Routing Codes: 11

Descriptor Code: 6

ICP054I **WARNING IOCP CANNOT DETERMINE LIMITS FOR PROCESSOR. CODE=*xxxxxxxx***

Explanation: IOCP does not recognize the CPC that it is running on. A logical error has occurred in IOCP. IOCDSs written on this CPC may not be valid for this CPC.

System Action: IOCP sends this warning message after the last statement has been processed, defaults to a set of predetermined machine limits and rules, and then continues processing.

Programmer Response: To determine which machine limits and rules IOCP used as defaults, note the value of the SYSTEM= keyword in the editor or from the report headings and then refer to Appendix F, “Machine Limits and Rules.” IOCP allows all channel path types to be defined. Ensure that the machine limits, channel limits, and rules are valid for your CPC before using the IOCDS for a power-on reset. Report the problem to your service representative.

ICP055I *CAUTION CHANNEL CONFIGURATION CONTAINS DISCREPANCIES**

Explanation: Your channel configuration contains one or more discrepancies. Discrepancies are channel configuration conditions that cannot exist on your CPC. The discrepancies are reported for each channel path in the PCHID Summary Report. See “PCHID Summary Report” on page 7-5 for a description of the channel configuration discrepancies.

System Action: IOCP prints this message at the end of the PCHID Summary Report and continues processing.

Programmer Response: Change your channel configuration to correct the discrepancies. For an explanation of the channel configuration rules for your CPC, see Appendix F, “Machine Limits and Rules.”

ICP056I IOCP JOB *jobname* FAILED. DID NOT BUILD LEVEL A*x* IOCDS.

Explanation: A job with name *jobname* was running IOCP with a WRTCDS option other than NO in the PARM parameter of the EXEC statement. However, IOCP did not write the IOCDS. One of the following occurred:

- An error was detected in the IOCP input statements
- The z/OS or VSE system operator previously replied NO to message ICP050D
- The CBD.CPC.IOCDS resource of the FACILITY class has been defined to an installed security product and the z/OS security administrator has not authorized you to update the CBD.CPC.IOCDS resource. See "Authorizing an IOCDS Write" on page 3-3.

IOCP sends this message to inform the programmer and the z/OS or VSE system operator (who previously responded to message ICP050D) that this job failed to build the A*x* IOCDS.

For z/OS users, IOCP only sends this message to the programmer (routing code 11) if the CBD.CPC.IOCDS resource of the FACILITY class has been defined to an installed security product.

System Action: IOCP ends the job with return code 8.

Operator Response: Tell your system programmer that the job failed.

Programmer Response: Review the messages in the job listing and take the necessary actions.

Routing Codes: 2 and 11

Descriptor Code: 6

ICP057I IOCP JOB *jobname* SUCCESSFUL. LEVEL A*x* IOCDS REPLACED.

Explanation: A job with name *jobname* was running IOCP with a WRTCDS option other than NO in the PARM parameter of the EXEC statement. IOCP sends this message to inform the programmer and the z/OS or VSE system operator (who previously granted permission to write the IOCDS in response to message ICP050D) that this job successfully replaced the A*x* IOCDS.

For z/OS users, IOCP only sends this message to the programmer (routing code 11) if the CBD.CPC.IOCDS resource of the FACILITY class has been defined to an installed security product and the z/OS security administrator has authorized you to update the CBD.CPC.IOCDS resource.

System Action: IOCP ends the job with return code 0, 2, or 4.

Operator Response: Follow your site procedures.

Programmer Response: No response is required. This is only an informational message.

Routing Codes: 2 and 11

Descriptor Code: 6

ICP058I IOCP DID NOT WRITE IOCDS A*x*

Explanation: IOCP was requested to write the A*x* IOCDS to the support element hard disk. However, IOCP did not write the IOCDS. One of the following occurred:

- An error was detected in the IOCP input statements
- The z/OS or VSE system operator previously replied NO to message ICP050D
- The CBD.CPC.IOCDS resource of the FACILITY class has been defined to an installed security product and the z/OS security administrator has not authorized you to update the CBD.CPC.IOCDS resource. See "Authorizing an IOCDS Write" on page 3-3.
- IOCP received an unexpected response code or return code attempting to write the IOCDS.

This is only an informational message.

System Action: IOCP prints this informational message at the end of the configuration reports. IOCP continues processing.

Programmer Response: Do one of the following:

- Correct the IOCP input statements

- Have the z/OS or VSE system operator reply YES to message ICP050D
- Have the z/OS security administrator authorize you to update the CBD.CPC.IOCDS resource of the FACILITY class.
- Perform the programmer response associated with the unexpected response code or return code.

ICP059I IOCP SUCCESSFULLY WROTE IOCDS A*x*

Explanation: IOCP was requested to write the A*x* IOCDS to the support element hard disk. IOCP successfully wrote the IOCDS. This is only an informational message.

System Action: IOCP prints this informational message at the end of the configuration reports. IOCP continues processing.

Programmer Response: No response is required.

ICP060I IOCP COULD NOT OPEN OR WRITE TO OUTPUT DATASET

Explanation: IOCP could not open or write to the output data set specified in the SYSPRINT DD statement. The SYSPRINT DD statement could be missing.

System Action: IOCP ends with return code of 12.

Programmer Response: Ensure that the DD statement for the SYSPRINT data set exists and is valid.

Routing Codes: 11

Descriptor Code: 6

ICP061I **WARNING EXECUTION PARAMETER LPAR=YES IS INVALID**

Explanation: You specified keyword LPAR=YES in the PARM parameter of the EXEC statement or CMS option LPAR for an LPAR I/O configuration. However, IOCP supports only LPAR I/O configurations. Although LPAR=YES and LPAR are currently accepted, IOCP will disallow them in the future.

System Action: IOCP ignores the parameter and continues processing.

Programmer Response: Do not specify LPAR=YES or LPAR.

ICP062I **WARNING COMMENTS | MESSAGES REMOVED FROM CARD IMAGE FILE**

Explanation: The card-image file was too big to read or write so stand-alone IOCP removed comments or IOCP messages from the file to reduce its size. When reading a card-image file, stand-alone IOCP removes comments or IOCP messages if necessary to reduce the file size so that it can read the entire file. When writing a card-image file to the support element hard disk, stand-alone IOCP removes comments or IOCP messages if necessary to reduce the file size so that it can be written.

The support element restricts the size of I/O configuration source (IOCS) files to 256,000 card records. Twenty additional records are reserved for IOCP messages.

IOCP messages are messages that IOCP inserted into the card-image file during processing. If IOCP messages are removed, the card-image file still contains the conditions that caused the messages but not the messages.

System Action: IOCP inserts this message at the top of the card-image file and continues processing.

Programmer Response: Reduce the size of the IOCS file you selected and then retry the IOCP function. To reduce the size of an IOCS file perform one or more of the following:

- Remove comment cards from the card-image file
- Consolidate IOCP statements that are continued across multiple cards onto a minimum number of cards
- Combine individual IODEVICE statements that attach to the same control unit(s) by using common UNIT and MODEL keyword values. Do not combine IODEVICE statements if they have conflicting keyword values.

ICP063I ERRORS=YES | NO | NA, MESSAGES=YES | NO | NA, REPORTS PRINTED=YES | NO | NA, IOCDS WRITTEN=YES | NO | NA, IOCS WRITTEN=YES | NO

Explanation: Stand-alone IOCP writes an I/O configuration source (IOCS) file for the Build data set and Disassemble data set functions. IOCP always includes this message in the IOCS file. The status of each item is YES, NO, or NA (not applicable for the requested IOCP function). YES indicates the following:

ERRORS
IOCP processing resulted in error messages

MESSAGES
IOCP processing resulted in caution and/or warning messages

REPORTS PRINTED
IOCP successfully printed its reports

IOCDS WRITTEN
IOCDS was successfully written to the support element hard disk

IOCS WRITTEN
IOCS was successfully written to the support element hard disk

The support element restricts the size of I/O configuration source (IOCS) files to 256,000 card records. Twenty additional records are reserved for IOCP messages.

If an IOCS is too large to write, IOCP writes an IOCS containing only this message and the status for IOCS WRITTEN is NO. Otherwise, this message appears at the bottom of the IOCS file and the status for IOCS WRITTEN is YES.

System Action: IOCP writes an IOCS containing this message and continues processing.

Programmer Response: For ERRORS status of YES, correct all errors and retry the requested IOCP function.

For MESSAGES status of YES, ensure that the caution or warning messages or both do not indicate a condition that needs to be corrected even though an IOCDS may have been successfully written.

For IOCS WRITTEN status of NO, reduce the size of the IOCS file you selected and then retry the IOCP function. To reduce the size of an IOCS file perform one or more of the following:

- Remove comment cards from the IOCS.
- Consolidate IOCP statements that are continued across multiple cards onto a minimum number of cards
- Combine individual IODEVICE statements that attach to the same control unit(s) by using common UNIT and MODEL keyword values. Do not combine IODEVICE statements if they have conflicting keyword values.

ICP064I **CAUTION IOCDS IS UNUSABLE UNTIL PROCESSOR IS UPGRADED TO SYSTEM=(*xxxx*,*n*) PROCESSOR**

Explanation: You wrote an IOCDS in preparation of a CPC upgrade using keyword CHECKCPC=NO in the PARM parameter of the EXEC statement (z/OS or VSE) or using CMS option NOCHKCPC. IOCP generated an IOCDS using the machine limits and rules for a SYSTEM=(*xxxx*,*n*) CPC. However, your current CPC is not associated with SYSTEM=(*xxxx*,*n*). Therefore, the IOCDS cannot be used to perform a power-on reset until your current CPC is upgraded to a CPC associated with SYSTEM=(*xxxx*,*n*).

System Action: IOCP prints this caution message after the last IOCP configuration report has been printed. IOCP continues processing.

Programmer Response: If your CPC is scheduled to be upgraded to a SYSTEM=(*xxxx*,*n*) CPC, do not use this IOCDS prior to the upgrade and inform the service representative which IOCDS should be used after the upgrade. If your CPC is not scheduled to be upgraded, change the SYSTEM keyword value to match your CPC and specify CHECKCPC=YES or CHECKCPC when running IOCP.

ICP065I ****WARNING** THE CONFIGURATION IS UNUSABLE ON THE EC LEVEL OF THIS PROCESSOR (*xxxxxxxx xxxxxxxx*)**

Explanation: Beginning with ICP IOCP 1.2.0, your configuration is unusable on the EC level of this processor. The IOCDS contains an unsupported function or channel path type for this model CPC at its current EC level. *xxxxxxxx xxxxxxxx* is a hexadecimal value that indicates the unsupported function or channel type. See Table F-6 on page F-9 to determine the meaning of the hexadecimal value. If the hexadecimal value is not defined in this edition of the IOCP User's Guide, refer to the latest edition of the document.

For ICP IOCP 1.1.0, this is a caution message and the following explanations apply:

- For batch IOCP users, your configuration is unusable on some EC levels of this processor. The IOCDS contains an unsupported function or channel path type for this model CPC at some ECs. *xxxxxxxx xxxxxxxx* is a hexadecimal value which indicates the possible unsupported function or channel type. See Table F-6 on page F-9 to determine the meaning of the hexadecimal value. If the hexadecimal value is not defined in this edition of the IOCP User's Guide, refer to the latest edition of the document.

  To determine what the EC installed on your CPC supports, select the I/O Configuration task on the support element and click **Supported I/O mask** under **View**. If the IOCDS contains anything that your CPC does not support, the display includes **Unsupported mask items**, which shows the exact items that are not supported.
- For stand-alone IOCP users, your configuration is unusable on the EC level of this processor. The IOCDS contains an unsupported function or channel path type for this model CPC at its current EC level. *xxxxxxxx xxxxxxxx* is a hexadecimal value which indicates the unsupported function or channel type. See Table F-6 on page F-9 to determine the meaning of the hexadecimal value. If the hexadecimal value is not defined in this edition of the IOCP User's Guide, refer to the latest edition of the document.

For more information about this message, see "CPC Activation and Power-on Reset Error" on page F-8.

System Action: IOCP prints this message after all reports have been processed and continues processing.

Programmer Response: Beginning with ICP IOCP 1.2.0, do not attempt to use the IOCDS at the current EC. Unsupported functions or channel types prevent an IOCDS from being used for power-on reset. If you intend to use the IOCDS at the current EC, write a new IOCDS that does not use the unsupported functions or channel path types. If you intend to use the IOCDS at a new EC following an upgrade and that EC supports the function or channel type, ignore this message.

For ICP IOCP 1.1.0, the following programmer responses apply:

- For batch IOCP users, if the EC installed on your CPC supports your configuration, ignore this message. Otherwise, do not attempt to use the IOCDS at the current EC. Unsupported functions or channel types prevent an IOCDS from being used for power-on reset. If you intend to use the IOCDS at the current EC, write a new IOCDS that does not use the unsupported functions or channel path types. If you intend to use the IOCDS at a new EC following an upgrade and that EC supports the function or channel type, ignore this message.
- For stand-alone IOCP users, do not attempt to use the IOCDS at the current EC. Unsupported functions or channel types prevent an IOCDS from being used for power-on reset. If you intend to use the IOCDS at the current EC, write a new IOCDS that does not use the unsupported functions or channel path types. If you intend to use the IOCDS at a new EC following an upgrade and that EC supports the function or channel type, ignore this message. If this message is in a disassembled I/O configuration source file after your CPC is upgraded, disassemble the IOCDS again to remove this message.

ICP066I ****WARNING** THE IOCDS CONFIGURATION CONTAINS INFORMATION NOT SUPPORTED BY THIS LEVEL OF IOCP (*xxxxxxxx xxxxxxxx*)**

Explanation: IOCP is processing an IOCDS to print reports for batch or stand-alone, or to disassemble the IOCDS into an I/O configuration source (IOCS) file on the support element hard disk for stand-alone only. The IOCDS was written by a higher level of IOCP than the one currently processing it and contains a function or channel path type that the current IOCP level does not support. *xxxxxxxx xxxxxxxx* is a hexadecimal value that indicates the unsupported function or channel type. See Table F-6 on page F-9 to determine the meaning of the hexadecimal value. If the hexadecimal value is not defined in this edition of the *IOCP User's Guide*, refer to the latest edition of the document.

The current level of IOCP cannot correctly process the unsupported function or channel type.

System Action: IOCP prints this message after all reports have been processed and continues processing. For stand-alone IOCP function Disassemble Data Set, IOCP includes this message at the top of the IOCS file that IOCP creates on the support element hard disk.

Programmer Response: Use the same level of IOCP to report on the IOCDS as the level of IOCP that wrote it. Do not use stand-alone IOCP to process this IOCDS. A disassembled IOCS containing this message can have incorrect or missing information and should not be used.

For stand-alone IOCP users, do not attempt to use the IOCDS at the current EC. For batch IOCP users, if your level of batch IOCP is greater than or equal to the level of stand-alone IOCP installed on this processor, do not attempt to use the IOCDS at the current EC. Unsupported functions or channel types prevent an IOCDS from being used for power-on reset. If you intend to use the IOCDS at the current EC, write a new IOCDS that does not use the unsupported functions or channel path types. If you intend to use the IOCDS at a new EC following an upgrade and that EC supports the function or channel type, ignore this message.

ICP067I ****WARNING** IOCDS WAS WRITTEN WITH IOCP VERSION *xx.xx.xx* WHICH IS HIGHER THAN VERSION OF IOCP PROCESSING IT**

Explanation: IOCP is processing an IOCDS to print reports for batch or stand-alone or to disassemble the IOCDS into an I/O configuration source (IOCS) file on the support element hard disk for stand-alone only. The IOCDS was written by a higher level of IOCP than the one currently processing it, and it may contain something the current IOCP level does not support, for example, a new keyword.

System Action: IOCP prints this message after all reports have been processed and continues processing. For stand-alone IOCP function Disassemble Data Set, IOCP includes this message at the top of the IOCS file IOCP creates on the support element hard disk.

Programmer Response: Use the same level of IOCP to report on the IOCDS as the level of IOCP that wrote it. For stand-alone IOCP function Disassemble Data Set, using the same level or a higher level of IOCP is always recommended. Do not disassemble until after the correct EC is installed. If you receive this message without messages ICP065I and ICP066I, the disassembled IOCS can be used if no significant differences exist between the IOCP that wrote the IOCDS and the current IOCP.

ICP068I **** WARNING ** IOCP WAS UNABLE TO DETERMINE IF THE CONFIGURATION IS USABLE ON THE EC LEVEL OF THIS PROCESSOR (CODE *xxxxxxxx*)**

Explanation: IOCP attempted to determine the IOCP functions and channel path types supported by the EC level of your processor but was unsuccessful.

System Action: IOCP prints this warning message after all reports have been processed and continues processing.

Programmer Response: Notify your service representative.

Problem Determination: If you are running IOCP on VM or as a guest on VM, see “IOCP Command Usage Notes for VM” on page 4-9 for possible reasons for the unsuccessful operation.

ICP069I **IOCP ASSIGNED A DEFAULT VALUE TO MAXDEV KEYWORD**

Explanation: Beginning with ICP IOCP 1.3.0, IOCP assigned a default value to the MAXDEV keyword. The IOCP input supports dynamic I/O configuration. If the MAXDEV keyword was not specified, IOCP assigns a default value for subchannel set 0 for each defined CSS and each subchannel set 1 that contains devices. If the MAXDEV keyword was specified, IOCP does the following:

- Assigns a default value for subchannel set 0 for each CSS that was defined on the RESOURCE statement but was omitted from the MAXDEV keyword.
- Assigns a default value for each subchannel set 1 that has devices but was omitted from the MAXDEV keyword.

The IOCP default value used is the maximum number of devices your CPC supports for a subchannel set. The hardware system area (HSA) space is the maximum possible for the subchannel set. For additional information, see Table F-3 on page F-5. This is only an informational message.

System Action: IOCP prints this informational message at the end of the IOCDS Totals Report and continues processing.

Programmer Response: In the device totals section of the IOCDS Totals Report, determine which subchannel sets were assigned a default value. Each default value has a special indicator following it (for example, '***'). If desired, specify a value for each defined subchannel set and CSS in the MAXDEV keyword.

ICP100I SYMBOL IN NAME FIELD EXCEEDS 8 CHARACTERS AND/OR CONTAINS INVALID CHARACTERS

Explanation: The symbolic name (label) that appears in the name field contains more than eight characters or contains incorrect characters. It must contain from 1-8 alphanumeric or special (#, @, $) characters, the first of which must be alphabetic or special. Only uppercase characters are allowed.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Correct the name field.

ICP101I OPERATION FIELD NOT FOUND

Explanation: The operation field (statement name) was not found before column 72. The statement name must have one or more blanks preceding and following it.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Check for format errors and correct the errors.

ICP102I UNSUPPORTED OPERATION - *xxxxxxxx*

Explanation: IOCP did not recognize string *xxxxxxxx* as a valid IOCP statement. The statement name must have one or more blanks preceding and following it.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Use a valid IOCP statement name in the operation field.

ICP103I **WARNING ID STATEMENT IGNORED - OUT OF SEQUENCE**

Explanation: IOCP found an ID statement after processing one or more other IOCP statements.

System Action: IOCP ignores the ID statement that is out of sequence and continues processing.

Programmer Response: Ensure that the ID statement is the first IOCP statement in the input.

ICP104I **WARNING MORE THAN ONE ID STATEMENT - ONLY THE FIRST WAS USED**

Explanation: More than one ID statement was found in the input statements. Only one ID statement can be specified.

System Action: IOCP processes the first ID statement, ignores any following ID statements, and continues processing.

Programmer Response: Ensure that there is only one ID statement in the input and that it is the first IOCP statement.

ICP105I OPERAND FIELD NOT FOUND

Explanation: The operand field was not found before column 72.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Correct the operand field.

ICP106I NON-BLANK CHARACTER(S) FOUND IN COLUMNS 1-15 OF CONTINUATION CARD

Explanation: A non-blank character was found in columns 1 to 15. On a continuation card, columns 1 to 15 must be blank and the operand field must start in column 16. (The preceding card had a non-blank character in column 72, indicating that this is a continuation card.)

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not

generate an IOCDS and it does not produce configuration reports.

Programmer Response: Ensure that the operand field on the continuation card starts in column 16.

ICP107I ***WARNING EXCEEDED THE ALLOWED NUMBER OF COMMENT CONTINUATION CARDS**

Explanation: More than two continuation cards were found for an IOCP comment card.

System Action: IOCP prints the extra comment continuation cards and continues processing.

Programmer Response: Restructure the comment so that it can be contained in a total of three comment cards, or code an asterisk in column 1 and remove the continuation characters in column 72 of the preceding cards.

ICP108I UNEXPECTED END OF FILE ON SYSTEM INPUT

Explanation: A continuation card was expected when an end-of-file condition occurred on the input data set. The last card contains a non-blank character in column 72.

System Action: IOCP does not generate an IOCDS and does not produce configuration reports.

Programmer Response: Ensure that no statements or comment cards are missing in the input.

ICP109I ***WARNING INVALID CHARACTER(S) IN MSG1 | MSG2 STRING TRANSLATED TO A VALID CHARACTER**

Explanation: The message string for keyword MSG1 or MSG2 in the ID statement contains one or more incorrect characters. Each incorrect character is translated to a double quote (″) and appears as such in the configuration report headings and on the IOCDSM frame of the support element. See the “English (U.S.) I/O Interface Code” table for EBCDIC characters in the *3270 IDS Character Set Reference*, GA27-2837, for a list of valid printable characters.

System Action: IOCP translates the incorrect character(s) to the valid character and continues processing.

Programmer Response: Correct the message string for MSG1 or MSG2.

ICP110I EXTRA LEFT PARENTHESIS - *xxxxxxxx*

Explanation: IOCP detected an extra left parenthesis as the first character of string *xxxxxxxx*. The parameter requires one or two left parentheses to start the keyword value field.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Correct the parameter.

ICP111I DELIMITER ERROR, EXPECT COMMA - *xxxxxxxx*

Explanation: IOCP expected a comma as the first character of string *xxxxxxxx*. The parameter requires that you use a comma to separate the values.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Correct the parameter or the delimiter.

ICP112I DELIMITER ERROR, EXPECT BLANK OR COMMA - *xxxxxxxx*

Explanation: IOCP expected a blank or comma as the first character of string *xxxxxxxx*. This can occur if a keyword value contains too many characters.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Correct the parameter or the delimiter.

ICP113I DELIMITER ERROR, EXPECT COMMA OR RIGHT PARENTHESIS - *xxxxxxxx*

Explanation: IOCP expected a comma or right parenthesis as the first character of string *xxxxxxxx*. This can occur if a keyword value contains too many characters.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Correct the parameter or the delimiter.

ICP114I DELIMITER ERROR, EXPECT LEFT PARENTHESIS - *xxxxxxxx*

Explanation: IOCP expected a left parenthesis as the first character of string *xxxxxxxx*. The parameter requires that you enclose the keyword value in parentheses.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Check for incorrect characters in the parameter and correct the delimiter.

ICP115I DELIMITER ERROR, EXPECT RIGHT PARENTHESIS - *xxxxxxxx*

Explanation: IOCP expected a right parenthesis as the first character of string *xxxxxxxx*. This can occur if a keyword value contains too many characters or if more parameters than your CPC supports were specified.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Correct the parameter and correct the incorrect delimiter with a right parenthesis.

ICP116I **WARNING CONTINUATION CARD TREATED AS A COMMENT BY IOCP**

Explanation: IOCP issues this message following a continuation card that is treated as a comment by IOCP (that is, it is ignored). Any continuation cards for the same statement that follow this message are also treated as comments by IOCP.

One of the following conditions is true:

- Card *n* is continued but the operand field on card *n* ends with a blank instead of a comma. Card *n*+1 receives this message and any keywords on card *n*+1 are ignored.
- Card *n* is continued but the operand field on card *n*+1 begins in column 17 or greater instead of column 16. Card *n*+1 receives this message and any keywords on card *n*+1 are ignored.

System Action: IOCP ignores the continuation cards being treated as comments and continues processing.

Programmer Response: Verify that there are no keywords on the continuation cards being treated as comments. If there are, fix the conditions that caused IOCP to treat them as comments. If there are no keywords and a valid comment exists on the continuation card, ignore the message or move the comment to a comment card. Comment cards begin with an asterisk (*) in column 1 or a period and asterisk (.*) in columns 1 and 2. See Appendix A, “Coding IOCP Statements” for more information on how to code IOCP statements and comments.

ICP117I INVALID CONTROL UNIT NUMBER

Explanation: An incorrect control unit number was entered as the value for keyword CUNUMBR on either a CNTLUNIT or an IODEVICE statement. Control unit numbers must be one to four hexadecimal digits in the range 0000-FFFE. FFFF is **not** a valid control unit number.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Correct the control unit number.

ICP118I PARAMETER CONTAINS INVALID CHARACTERS

Explanation: A parameter contains one or more incorrect characters. See the “English (U.S.) I/O Interface Code” table for EBCDIC characters in *3270 IDS Character Set Reference* GA27-2837, for a list of valid printable characters.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Correct the incorrect characters in the parameter.

ICP119I BEGINNING APOSTROPHE NOT FOUND

Explanation: The beginning apostrophe was not found in a parameter that requires the keyword value to be enclosed in apostrophes.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Correct the parameter.

ICP120I ENDING APOSTROPHE NOT FOUND

Explanation: The ending apostrophe was not found in a parameter that requires the keyword value to be enclosed in apostrophes.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Correct the parameter.

ICP121I OPERAND FIELD IS TOO LONG TO PROCESS

Explanation: The length of the operand field is greater than the length IOCP can process for operand fields. Maximum length for an operand field is 1024 characters.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Check that the statement and continuation cards are correctly specified.

ICP122I REQUIRED KEYWORD IS MISSING - *xxxxxxxxx*

Explanation: One or more required keywords were not specified in the statement. String *xxxxxxxxx* is one of the required keywords that is missing. String *xxxxxxxxx* is blank if no keyword is specified on the ID statement. The ID statement does not require a specific keyword but requires that at least one keyword be specified.

The SYSTEM keyword on the ID statement is required when IOCP is writing an IOCDS in preparation of a CPC upgrade (that is, keyword CHECKCPC=NO is specified in the PARM parameter of the EXEC statement (z/OS or VSE) or CMS option NOCHKCPC is specified).

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Ensure that all required keywords are specified.

ICP123I DUPLICATE KEYWORDS ON STATEMENT

Explanation: A keyword parameter was found more than once in the statement. Keyword parameters cannot be repeated in the same statement. IOCP considers the CHPARM and OS keywords as duplicates.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Ensure that keyword parameters are not duplicated.

ICP124I MISSING A REQUIRED KEYWORD FOR UNSPANNED CHPID

Explanation: The NOTPART, PARTITION, SHARED, or IOCLUSTER keyword must be specified for all unspanned channel paths. An unspanned channel path is defined to only one CSS.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Ensure that each CHPID statement defining an unspanned channel path specifies the NOTPART, PARTITION, SHARED, or IOCLUSTER keyword.

ICP125I PARAMETER CONTAINS NON-NUMERIC CHARACTERS - *xxxxxxxx*

Explanation: In string *xxxxxxxx*, a character other than 0-9 was found in a parameter for a keyword value that requires a decimal value.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Correct the keyword value.

ICP126I PARAMETER CONTAINS NON-HEXADECIMAL CHARACTERS OR INCORRECT LENGTH - *xxxxxxxx*

Explanation: In string *xxxxxxxx*, a character other than 0-9 or A-F was found in a parameter for a keyword value that requires a hexadecimal value, or not enough digits were specified in a keyword value. (Note that the channel path identifier in the PATH and CPATH parameters require two digits. Also, link addresses in the LINK parameter require two or four digits.)

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Correct the keyword value.

ICP127I UNKNOWN KEYWORD - *xxxxxxxx*

Explanation: IOCP found an unknown keyword parameter in string *xxxxxxxx*.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Correct the unknown keyword parameter.

ICP128I INVALID PROTOCL VALUE. MUST BE D, S, OR S4

Explanation: A character other than D, S, or S4 was found as the keyword value in the PROTOCL parameter.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Correct the keyword value.

ICP129I INVALID SHARED VALUE. MUST BE Y OR N

Explanation: A character other than Y or N was found as the keyword value in the SHARED parameter of the CNTLUNIT statement.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Correct the keyword value.

ICP130I **WARNING IOCDS WILL NOT SUPPORT DYNAMIC I/O CONFIGURATION**

Explanation: A change was made to the card-image file with the stand-alone IOCP editor. Dynamic I/O configuration is not supported by the IOCDS written from the modified card-image file and the following conditions exist:

- The MAXDEV keyword on the RESOURCE statement is ignored
- Managed channel paths are unusable
- Any reserved logical partitions exist in the hardware system area (HSA) space but cannot be used.

System Action: IOCP prints this warning message following the ID statement and continues processing.

Programmer Response: If the IOCDS should support dynamic I/O configuration, import the I/O configuration source (IOCS) file again and build the data set without making any modifications with the editor. If dynamic I/O configuration is not required, keep the modified IOCDS.

ICP131I CONTINUATION CHARACTER EXPECTED BUT NOT FOUND

Explanation: IOCP expected to find a continuation character (any non-blank character in column 72) and did not find one. IOCP expects a continuation character when the operand field of a statement ends with a comma. IOCP also expects a continuation character when the operand field of a statement ends in column 71 and the next card has blanks in columns 1-15 and a non-blank in column 16.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: If the statement should have been continued, place a non-blank character in column 72. If the statement should not be continued, remove the condition that caused IOCP to expect a continuation character (for example, remove the trailing comma).

ICP132I INVALID TIMEOUT VALUE. MUST BE Y OR N

Explanation: A character other than Y or N was found as the keyword value in the TIMEOUT parameter.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Correct the keyword value.

ICP133I INVALID TYPE VALUE

Explanation: A keyword value other than CBY, CVC, CNC, CTC, CFS, CFR, CFP, CBS, CBR, CBP, ICP, OSC, OSD, OSE, OSN, FCV, FC, FCP, or IQD was found in the TYPE parameter.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Correct the keyword value.

ICP134I UNIT OR MODEL PARAMETER CONTAINS INVALID CHARACTERS

Explanation: An incorrect character was found in the UNIT or MODEL parameter. The allowable characters are alphanumeric and special (#, @, and $). Only uppercase characters are allowed. The UNIT keyword on the CNTLUNIT statement also accepts a hyphen (-) as a valid character.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Correct the UNIT or MODEL parameters.

ICP135I INVALID UNITADD NUMBER

Explanation: In the UNITADD parameter, a keyword value for number was not within the allowable range of decimal 1-256.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Correct the keyword value.

ICP136I INVALID DEVICE NUMBER COUNT

Explanation: In the ADDRESS parameter, a keyword value for count was not within the allowable range of decimal 1-256.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Correct the keyword value.

ICP137I CHPID IS NOT SHARED AND NOT RECONFIGURABLE - INVALID CANDIDATE LIST

Explanation: The PART or PARTITION keyword has an incorrect candidate list because the channel path is neither shared nor reconfigurable. The following conditions in the PART or PARTITION keyword will produce this error for unshared and non-reconfigurable channel paths:

- Null access list with no candidate list
- Null access list with a candidate list of two or more logical partitions (LP)
- An access list of one LP with a candidate list specifying a different LP.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: If the channel path should be reconfigurable, specify the REC parameter in the PART or PARTITION keyword. If the channel path should be shared, specify the SHARED keyword or replace the PART or PARTITION keyword with the NOTPART keyword. Otherwise, do one of the following:

- For a null access list, specify a candidate list with one LP
- For an access list of one LP, delete the candidate list or change it to an equal sign (=).

ICP138I NULL CANDIDATE LIST SPECIFIED FOR CHPID *xx* IN CSS *y*

Explanation: You generated a candidate list that contained no logical partitions (a null candidate list) for channel path *xx* in CSS *y* by specifying one of the following in the CHPID statement:

- A zero as the access list and an equal sign (=) as the candidate list for CSS *y* using the PART, PARTITION, or NOTPART keyword.
- All logical partitions (LPs) in the configuration for CSS *y* in the candidate list parameter of the NOTPART keyword.

A channel path must have at least one LP in its generated candidate list from each CSS in which it is defined.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: In the CHPID statement, do one of the following:

- Specify at least one LP in the candidate list for each CSS
- Delete at least one LP from CSS *y* in the candidate list parameter of the NOTPART keyword
- For a spanned channel path that you do not want to have access to any LP in a CSS, remove the CSS ID from the PATH keyword of the CHPID statement.

ICP139I **WARNING PCHID KEYWORD WAS NOT SPECIFIED ON EVERY CHPID STATEMENT REQUIRING IT**

Explanation: IOCP found one or more CHPID statements for a deck verification where the PCHID keyword is required but was not specified. IOCP performs a deck verification if the WRTCDS PARM keyword is not specified or if WRTCDS=NO or NOWRTCDS is specified. The PCHID keyword is required for all channel paths except ICP and IQD (TYPE keyword).

System Action: IOCP prints this message after the last statement is processed and then continues processing the configuration reports.

Programmer Response: Specify the PCHID keyword on every CHPID statement that requires it before attempting to write an IOCDS. The CHPID mapping tool can be used to assign PCHID numbers to channel paths. See “Using a

PCHID Report to Help Plan Your I/O Configuration" on page 1-9.

ICP140I INVALID PCHID VALUE

Explanation: The PCHID keyword contains a value that your CPC does not support. See "Machine Limits" on page F-3 to determine the maximum PCHID number your CPC supports.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports

Programmer Response: Correct the keyword value.

ICP141I **WARNING MORE THAN ONE RESOURCE STATEMENT - ONLY THE FIRST WAS USED**

Explanation: More than one RESOURCE statement was found in the input statements. Only one RESOURCE statement can be specified.

System Action: IOCP processes the first RESOURCE statement, ignores any following RESOURCE statements, and continues processing.

Programmer Response: Ensure that there is only one RESOURCE statement in the input and that it follows the ID statement and precedes all CHPID statements.

ICP142I RESOURCE STATEMENT IS REQUIRED

Explanation: IOCP did not find a RESOURCE statement or the RESOURCE statement contained errors. The RESOURCE statement is required.

System Action: IOCP ends with a return code of 8.

Programmer Response: Ensure that the RESOURCE statement is specified, that it precedes all CHPID statements, and it contains no errors.

ICP143I CHPID ERROR. CODE=*xx*

Explanation: IOCP detected one of the following errors on the CHPID statement:

Code	Description
01	The IOCLUSTER keyword value is incorrect. The value must contain a maximum of eight alphanumeric or special (@, #, or $) characters.
02	Too many I/O cluster names have been defined with the IOCLUSTER keyword. A maximum of 64 I/O cluster names can be defined in the configuration.
03	The IOCLUSTER keyword and PART, PARTITION, or NOTPART keyword were specified on the same CHPID statement. Specify only one of these keywords.
04	The IOCLUSTER keyword was specified for a channel path that is not managed (CHPARM keyword). The IOCLUSTER keyword is valid only for managed channel paths.
05	A channel path cannot be specified as spanned (defined in more than one CSS) and managed (CHPARM keyword).
06	Managed channel paths require that the IOCDS be dynamic-capable (TOK keyword). A dynamic-capable IOCDS is built when using HCD or specifying IOCP CMS utility option DYN for VM.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Ensure that the CHPID statement is coded correctly.

ICP144I CNTLUNIT ERROR. CODE=*xx*

Explanation: IOCP detected one of the following errors on the CNTLUNIT statement:

Code	Description

01 Only pairs of asterisks (**) were specified in the PATH keyword parameter. The PATH keyword parameter must contain at least one *chpid* number for each specified CSS.

02 All the channel paths attaching to a managed control unit (PATH keyword) must be shared.

03 The control unit is managed (PATH keyword) but a channel path type other than CNC, FCV, or FC attaches to the control unit. Only CNC, FCV, and FC channel paths can attach to a managed control unit.

04 A link address (LINK keyword) other than two asterisks (**) was specified for a channel path of two asterisks (**) in the PATH keyword on the CNTLUNIT statement. The link address must be two asterisks.

05 A managed channel path (CHPARM keyword on CHPID statement) is defined on a control unit. Managed channel paths cannot be defined on a control unit.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Ensure that the CNTLUNIT statement is coded correctly.

ICP145I DEVICE NUMBER EXCEEDS HEX FFFF

Explanation: In the ADDRESS parameter of the IODEVICE statement, the keyword value for the device number plus the value for count minus one, exceeds the allowable value of hexadecimal FFFF for a device number.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Correct the keyword values.

ICP146I INVALID STADET VALUE. MUST BE Y OR N

Explanation: A character other than Y or N was found as the keyword value in the STADET parameter.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Correct the keyword value.

ICP147I INVALID PARTITION NAME - *xxxxxxxx*

Explanation: The PARTITION name *xxxxxxxx* contains more than eight characters or contains incorrect characters. The PARTITION name must contain from one to eight alphanumeric characters, the first of which must be alphabetic. Only uppercase characters are allowed. Note that you can also specify an asterisk (*) to reserve a logical partition until a future dynamic I/O configuration change is made to assign a name to the logical partition. The words PHYSICAL, REC, SYSTEM, and PRIM*xxxx* (where *xxxx* is a 4-digit decimal number) are reserved and cannot be used as the names of logical partitions.

You cannot specify a logical partition name of zero (0) for a candidate list on a CHPID statement. If you specify zero (0) for a null channel path access list or a null device candidate list, you cannot also specify a logical partition name.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Correct the keyword value.

ICP148I INVALID PARTITION PARAMETER - *xxxxxxxx*

Explanation: The PARTITION keyword has an incorrect value beginning with the first character of string *xxxxxxxx*. IOCP expected the REC parameter value.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Correct the keyword value.

ICP149I PARTITION *xxxxxxxx* HAS NOT BEEN DEFINED [FOR CSS *y*]

Explanation: You specified partition name *xxxxxxxx*, which was not defined by the RESOURCE statement or was defined but not for CSS *y*. The RESOURCE statement must define all partition names in the configuration. Also, the CSS ID number, if specified, must be the one to which the partition has access.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Ensure the partition name on the CHPID or IODEVICE statement is correct. If the partition name is correct but undefined, add it to the RESOURCE statement. If the partition name is correct but the CSS ID number is not, correct the CSS ID number.

ICP150I INVALID SYSTEM PARAMETER

Explanation: The SYSTEM parameter contains an incorrect value. The valid values are listed in Appendix F, "Machine Limits and Rules."

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Correct the SYSTEM keyword value or remove the keyword.

ICP151I SYSTEM KEYWORD IGNORED. SYSTEM=(*xxxx,n*) USED BY ICP IOCP

Explanation: The SYSTEM keyword is ignored by the stand-alone version of IOCP and also when IOCP is writing an IOCDS. IOCP has used the machine limits and rules associated with the parameter SYSTEM=(*xxxx,n*). You have specified a SYSTEM keyword value that does not support your CPC. For additional information, see Appendix F, "Machine Limits and Rules." This is only an informational message.

System Action: IOCP prints this message after the ID statement and then continues processing.

Programmer Response: For stand-alone IOCP or when writing an IOCDS to a CPC that is not being upgraded, ignore the message or change the SYSTEM keyword value to match your CPC. If you are upgrading your CPC to a CPC that requires a different SYSTEM keyword value, you can do one of the following:

- Use the SYSTEM keyword value to verify that the IOCP input file is valid (IOCP processing parameter WRTCDS=NO or NOWRTCDS). This IOCP input file can be given to the service representative who will be upgrading the CPC.
- Use the SYSTEM keyword value and write the IOCDS to your current CPC (IOCP processing parameter CHECKCPC=NO or NOCHKCPC) in preparation for its being upgraded. See "Machine Rules" on page F-2 to determine if ICP IOCP supports writing an IOCDS to your current CPC in preparation for an upgrade.

ICP152I SYSTEM=(*xxxx,n*) USED BY ICP IOCP

Explanation: You did not specify the SYSTEM keyword in the ID statement. IOCP sends this message to inform you that IOCP used the machine limits and rules associated with the parameter SYSTEM=(*xxxx,n*). This is only an informational message.

System Action: If an ID statement is present, IOCP prints this message after processing it. If it is not present, IOCP prints this message after the last statement is processed and then continues processing.

Programmer Response: Ignore this message in the following situations:

- IOCP used the correct machine limits and rules for your configuration for a deck verification (WRTCDS=NO or NOWRTCDS)
- You are writing an IOCDS
- You are using a stand-alone version of IOCP.

Otherwise, specify the correct SYSTEM keyword value on the ID statement. For additional information, see "Machine Limits" on page F-3.

You can prevent IOCP from issuing this message by specifying SYSTEM=(*xxxx*,*n*) in the ID statement.

ICP153I NOTPART AND PARTITION KEYWORDS CANNOT SPECIFY THE SAME CSS

Explanation: You cannot specify the same CSS ID in both the NOTPART and PARTITION keywords on the same CHPID or IODEVICE statement. Specify the CSS ID in only one of these keywords on a statement.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Remove the duplicate CSS ID from the NOTPART or PART or PARTITION keyword from the statement.

ICP154I INVALID MIF IMAGE ID NUMBER

Explanation: The PARTITION parameter on the RESOURCE statement contains an incorrect MIF image ID number. The number must be a one-digit hexadecimal number in the range of 1-F.

System Action: IOCP ends with a return code of 8.

Programmer Response: Correct the keyword value.

ICP155I DUPLICATE MIF IMAGE ID NUMBERS SPECIFIED

Explanation: You specified the same MIF image ID number for more than one partition in a CSS on the RESOURCE statement. Every partition in a CSS must have a unique MIF image ID number.

System Action: IOCP ends with a return code of 8.

Programmer Response: Correct the keyword value.

ICP156I DUPLICATE PARTITION NAMES SPECIFIED

Explanation: You specified the same partition name more than once on the RESOURCE statement, an IODEVICE statement, or in the access list or the candidate list on a CHPID statement. You may not duplicate partition names in the following:

- RESOURCE statement
- Access list of a CHPID statement
- Candidate list of a CHPID statement
- IODEVICE statement

System Action: For the RESOURCE statement, IOCP ends with a return code of 8. For all other statements, IOCP continues to validate and check the syntax of all other statements. It does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Correct the keyword value.

ICP157I TOO MANY PARTITION NAMES SPECIFIED

Explanation: You specified too many partition names on the RESOURCE statement, an IODEVICE statement, or in the access list or the candidate list on a CHPID statement. You cannot specify more than 15 partition names in a CSS, and you cannot specify more partition names than your CPC supports. For additional information, see “Machine Limits” on page F-3. You can specify only the maximum number of partitions names that your CPC supports in the following:

- RESOURCE statement
- Access list of a CHPID statement
- Candidate list of a CHPID statement
- IODEVICE statement.

System Action: For the RESOURCE statement, IOCP ends with a return code of 8. For all other statements, IOCP continues to validate and check the syntax of all other statements. It does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Correct the keyword value.

ICP158I CHPIDS CANNOT BE SHARED AND RECONFIGURABLE

Explanation: You specified a channel path as both shared and reconfigurable, which is not allowed. A channel path is shared if you specify the channel path as spanned or the SHARED keyword or an access list of more than one logical partition in the CHPID statement. A channel path is reconfigurable if you specify the REC parameter of the PART or PARTITION keyword in the CHPID statement.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: If the channel path should be shared, delete the REC parameter from the PARTITION keyword. Otherwise, delete the SHARED keyword or reduce the number of partitions in the access list to one or specify a null access list.

ICP159I [MAXDEV KEYWORD | RESERVED LP (*)] NOT ALLOWED BECAUSE THE I/O DEFINITION DOES NOT SUPPORT DYNAMIC I/O CONFIGURATION

Explanation: The MAXDEV keyword or a reserved logical partition (*) was specified for a non-dynamic-capable I/O configuration (that is, TOK keyword on the ID statement is not present). You can specify the MAXDEV keyword and reserved logical partitions only for a dynamic-capable IOCDS. A dynamic-capable IOCDS is built when using HCD or specifying IOCP CMS utility option DYN for VM.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: If the IOCDS should support a dynamic-capable I/O configuration, use HCD or IOCP CMS utility option DYN to write the IOCDS. If dynamic I/O configuration is not required (non-HCD users only), remove the MAXDEV keyword from the RESOURCE statement and remove all reserved logical partitions (*) from the PART or PARTITION keyword on the RESOURCE statement.

ICP160I INVALID MAXDEV VALUE - *xxxxx*

Explanation: An incorrect maximum number of devices was entered as the value for keyword MAXDEV on the RESOURCE statement. The maximum number of devices can be specified as one to five decimal digits in the range 0-*n* where *n* is the maximum number of devices your CPC supports. For additional information, see “Machine Limits” on page F-3. The maximum number of devices can also be specified as a K value, for example, 63K. Note that there must be a decimal number preceding the ″K″.

System Action: IOCP ends with a return code of 8.

Programmer Response: Correct the keyword value.

ICP161I **WARNING MAXDEV VALUE FOR SUBCHANNEL SET *y* IN CSS *x* EXCEEDS MAXIMUM NUMBER ALLOWED**

Explanation: The maximum number of devices specified for subchannel set *y* in CSS *x* exceeded the maximum number of devices your CPC supports. For additional information, see “Machine Limits” on page F-3. IOCP used the maximum number of devices your CPC supports for the subchannel set.

System Action: IOCP prints this message after the RESOURCE statement and then continues processing.

Programmer Response: Correct the keyword value.

ICP162I **WARNING MAXDEV KEYWORD NOT SPECIFIED. HSA FOR MAXIMUM NUMBER OF DEVICES WILL BE ALLOCATED**

Explanation: The MAXDEV keyword was not specified on the RESOURCE statement and the IOCP input supports dynamic I/O configuration. IOCP used the maximum number of devices your CPC supports for subchannel set 0 for each CSS. IOCP also used the maximum number of devices your CPC supports for subchannel set 1 for each CSS that has devices defined in subchannel set 1. The hardware system area (HSA) space will be the maximum possible for subchannel set 0 for each CSS and for each subchannel set 1 that has devices. For additional information, see “Machine Limits” on page F-3.

System Action: IOCP prints this message after the RESOURCE statement and then continues processing.

Programmer Response: Specify the MAXDEV keyword with the appropriate value or values for each defined CSS.

ICP163I ****WARNING MAXDEV KEYWORD IGNORED**

Explanation: The MAXDEV keyword was specified for a non-dynamic-capable I/O configuration that was once dynamic-capable. A dynamic-capable IOCDS is built when using HCD on OS/390, z/OS, or VM or specifying IOCP CMS utility option DYN for VM. A dynamic-capable I/O configuration can be rendered non-dynamic when the IOCP input file is modified with stand-alone IOCP or the TOK keyword has an incorrect value.

System Action: IOCP prints this message after the RESOURCE statement, sets the maximum number of devices for each defined CSS to the maximum number your CPC supports and then continues processing. See “Machine Limits” on page F-3.

Programmer Response: Use HCD or IOCP CMS utility option DYN to regenerate the IOCP input as dynamic.

ICP164I MAXDEV KEYWORD DID NOT SPECIFY A VALUE FOR EVERY DEFINED CSS

Explanation: For ICP IOCP 1.1.0 and 1.2.0, the MAXDEV keyword did not specify a value for each CSS that was defined on the RESOURCE statement. IOCP used the maximum number of devices your CPC supports for each unspecified CSS. The hardware system area (HSA) space will be the maximum possible for each unspecified CSS. For additional information, see “Machine Limits” on page F-3. This is only an informational message.

System Action: IOCP prints this message after the RESOURCE statement and then continues processing.

Programmer Response: Specify a value for each defined CSS in the MAXDEV keyword.

ICP165I CSS PARAMETER IS REQUIRED ON KEYWORD *xxxxxxxx*

Explanation: The CSS parameter identifies the CSS to which the *xxxxxxxx* keyword values apply. CSS is required for the following keywords and conditions:

- PART or PARTITION on the RESOURCE statement when a CSS ID other than zero is to be defined.
- MAXDEV when more than one CSS is defined.
- PATH on the CHPID and CNTLUNIT statements when more than one CSS is defined.
- NOTPART and PART or PARTITION on the CHPID statement when the channel path is spanned.
- CPATH when the connecting channel path is in a different CSS from the channel path being defined or the channel path being defined is spanned.
- LINK when the control unit has paths in multiple CSSs.
- PATH, NOTPART and PART or PARTITION on the IODEVICE statement when the device has access to channel paths in multiple CSSs.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Specify the CSS parameter on keyword *xxxxxxxx*.

ICP166I CSS *x* HAS NOT BEEN DEFINED

Explanation: CSS *x* is specified in the CSS parameter value but is not defined on the RESOURCE statement.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Correct the parameter value or define the CSS on the RESOURCE statement.

ICP167I INVALID CSS ID NUMBER - *x*

Explanation: An incorrect CSS ID number was specified as the value for the CSS parameter. CSS ID numbers must be one decimal digit in the range 0 to the maximum your CPC supports. For additional information, see “Machine Limits” on page F-3.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Correct the CSS ID number.

ICP168I DUPLICATE CSS ID NUMBERS SPECIFIED

Explanation: A CSS ID number was found more than once in the CSS parameters of a keyword. CSS ID numbers cannot be repeated in the CSS parameters of a keyword.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Ensure that CSS ID numbers are not duplicated.

ICP169I CSS x NOT SPECIFIED IN PATH KEYWORD

Explanation: You specified CSS x which was not specified in the CSS parameter of the PATH keyword. On the CHPID and CNTLUNIT statements, only the CSS ID numbers specified on the PATH keyword can be specified in the CSS parameters of the other keywords on that statement.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Ensure only CSS ID numbers specified on the PATH keyword for CHPID and CNTLUNIT statements are specified on other keywords.

ICP170I PARTITION AND NOTPART KEYWORDS SPECIFIED TOO MANY CSS PARAMETERS

Explanation: The total number of CSS ID numbers specified in the CSS parameters of both the PARTITION and NOTPART keywords exceeds the maximum number of CSSs allowed for your CPC. You cannot specify more CSSs than your CPC supports. For additional information, see “Machine Limits” on page F-3.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Reduce the number of CSSs specified by the PARTITION and NOTPART keywords.

ICP171I **WARNING OS KEYWORD CONVERTED TO CHPARM KEYWORD**

Explanation: The OS keyword has been converted to the CHPARM keyword. Although the OS keyword is currently accepted, IOCP will disallow it in the future.

System Action: IOCP prints this warning message following the CHPID statement in question and continues processing.

Programmer Response: Change all OS keywords to the CHPARM keyword.

ICP172I MIF IMAGE ID IS REQUIRED FOR RESERVED PARTITION

Explanation: You specified a reserved logical partition (*) without a MIF image ID. Each reserved logical partition requires a MIF image ID.

System Action: IOCP ends with a return code of 8.

Programmer Response: Specify a MIF image ID for every reserved logical partition.

ICP173I PARTITION NAME IS REQUIRED

Explanation: You specified only reserved logical partitions (*) and did not specify any logical partitions with names. An I/O configuration must have at least one logical partition defined with a name.

System Action: IOCP ends with a return code of 8.

Programmer Response: Specify a logical partition with a name.

ICP174I NO PARTITION NAMES DEFINED IN CSS *x*

Explanation: You specified CSS *x* in the PATH keyword but CSS *x* contains only reserved logical partitions (*). You cannot assign a channel path to a CSS that only contains reserved logical partitions.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Assign the channel path to a CSS with a named logical partition.

ICP175I INVALID SCHSET ID NUMBER

Explanation: An incorrect subchannel set ID number was specified as the value for a SCHSET keyword parameter. Subchannel set ID numbers must be one digit in the range 0 to the maximum your CPC supports. For additional information, see Table F-3 on page F-5.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Correct the subchannel set ID number.

ICP200I CHPID *xx* PREVIOUSLY DEFINED IN CSS *y*

Explanation: The user has defined a channel path (*xx*) in CSS *y* to be added to the IOCDS, but an entry for channel path *xx* in CSS *y* already exists in the IOCDS.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Ensure that duplicate channel paths in the same CSS are not specified in the CHPID statements.

ICP201I CPATH KEYWORD NOT ALLOWED ON CHPID TYPE=*xxx*

Explanation: You specified the CPATH keyword for a TYPE=*xxx* channel path. It is valid only for TYPE=ICP channel paths.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Either delete the CPATH keyword or change the channel path type to ICP.

ICP202I SWITCH KEYWORD NOT ALLOWED ON CHPID TYPE=*xxx*

Explanation: You specified the SWITCH keyword for a TYPE=*xxx* channel path. It is valid only for CVC, CBY, CNC, CTC, FCV, and FC channel paths.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Either delete the SWITCH keyword or change the channel path type.

ICP203I SWITCH *xx* ALREADY USED BY CHPID *yy*

Explanation: SWITCH number *xx* was already defined for channel path *yy*. FC channel paths (TYPE keyword) cannot use the same switch number as CVC, CBY, CNC, CTC, and FCV channel paths.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Change the switch number so that a director with FC channel paths has only FC channel paths.

ICP204I MAXIMUM NUMBER OF CHANNEL PATHS ALLOWED FOR CHPID TYPE HAS BEEN EXCEEDED

Explanation: The channel path cannot be defined for one of the following reasons:

- The maximum number of CFS, CFR, CFP, CBS, CBR, CBP, and ICP channel paths has been reached for your CPC.
- The maximum number of FC, FCV and FCP channel paths has been reached for your CPC.
- The maximum number of IQD channel paths has been reached for your CPC.
- The maximum number of OSC, OSD, OSE, OSN, and FCP channel paths has been reached for your CPC.

See Table F-3 on page F-5 to find the maximum number of channel paths that your CPC supports for a particular channel path type.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Adjust the number of channel paths to the number your CPC supports.

ICP205I TYPE=*xxx* CHPIDS CANNOT BE SPECIFIED AS SHARED

Explanation: You attempted to define a TYPE=*xxx* channel path as a shared channel path by specifying the SHARED, NOTPART, or IOCLUSTER keyword or an access list of more than one logical partition (LP) in the PART or PARTITION keyword in the CHPID statement. You can share only CNC, CTC, CFS, CFP, CBS, CBP, ICP, OSC, OSD, OSE, OSN, FCV, FC, FCP, and IQD channel paths.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Either change the channel path type or define an unshared channel path by deleting the SHARED, NOTPART, or IOCLUSTER keywords and reducing the access list in the PART or PARTITION keyword to one LP.

ICP206I TYPE=*xxx* CHPIDS INVALID FOR THIS PROCESSOR

Explanation: You specified a channel path type for a CPC that does not support it. See Table F-4 on page F-6 to determine the channel path types your CPC supports.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Either change the channel path type to one the CPC supports or change the SYSTEM keyword value to a CPC that supports the channel path type you want to define.

ICP207I PCHID *xxx* PREVIOUSLY DEFINED

Explanation: You have defined a physical channel ID (PCHID) *xxx* to be added to the IOCDS, but an entry for PCHID *xxx* already exists in the IOCDS.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Ensure that duplicate PCHIDs are not specified in the CHPID statements.

ICP208I PCHID KEYWORD NOT ALLOWED ON CHPID TYPE=*xxx*

Explanation: You specified the PCHID keyword for a TYPE=*xxx* channel path. It is not allowed for ICP and IQD channel paths.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Either delete the PCHID keyword or change the channel path type.

ICP209I TYPE=*xxx* CHPIDS CANNOT BE DEFINED AS SPANNED

Explanation: You attempted to define a TYPE=*xxx* channel path as spanned by specifying more than one CSS ID in the CSS parameter of the PATH keyword in the CHPID statement. Only FC, FCP, CFS, CFP, CBS, CBP, ICP, OSC, OSD, OSE, OSN, and IQD channel paths can be spanned across multiple CSSs on some CPCs. See “Keyword Applicability” on page F-7 to determine which channel path types can be spanned on which CPCs.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Either change the channel path type or specify a single CSS ID in the CSS parameter of the PATH keyword.

ICP210 CHPARM=*xx* IS INVALID FOR TYPE=*yyy* CHPIDS

Explanation: You specified the CHPARM keyword with a value of *xx* for a TYPE=*yyy* channel path. The CHPARM keyword is valid only for CNC, FCV, FC, OSD, and IQD channel paths. For CNC, FCV, and FC channel paths, the valid values are 00 and 01. For OSD channel paths, the valid values are 00 and 02. For IQD channel paths, the valid values are 00, 40, 80, and C0.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Ensure that CHPARM is specified only for channel path types that support it and specifies only a valid value for the channel path type.

ICP225I CONTROL UNIT *xxxx* ALREADY DEFINED ON THE CHANNEL PATH ASSOCIATED WITH CHPID *yy* IN CSS *z*

Explanation: A CNC, CTC, FCV, or FC channel path (TYPE keyword) cannot attach to more than one control unit unless it attaches to an ESCON or FICON Director (SWITCH keyword) or unless the control units have unique logical addresses (CUADD keyword). An IQD or OSD channel path (TYPE keyword) cannot have more than one control unit defined to it unless the control units have unique logical addresses (CUADD keyword). Control unit *xxxx* does not have a logical address and channel path *yy* in CSS *z* does not attach to a director.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Do one of the following:

- Attach the channel path to an ESCON or FICON Director
- If you are defining a control unit that supports logical addressing, specify the unique logical addresses that your control unit supports using the CUADD keyword.

  Note: Not all ESCON and FICON control units support logical addressing.
- If you need to define more than 256 devices for an IQD channel path or 254 devices for an OSD channel path, multiple control units must be defined. Specify a unique logical address for each control unit using the CUADD keyword.

ICP226I LINK ADDRESS MUST BE SUPPLIED. CHPID *xx* IN CSS *y* ATTACHES TO SWITCH *zz*

Explanation: A valid link address (LINK keyword) must be supplied for all channel paths that attach to an ESCON or FICON Director (SWITCH keyword). The valid link address range is 01-FE (hex) for CVC, CBY, CNC, CTC, and FCV channel paths (TYPE keyword). The valid link address range is 0000-FFFF for an FC channel path. A link address of ** or **** is not valid for a channel path that attaches to a director.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Specify a valid link address for all channel paths in the PATH parameter of the CNTLUNIT statement that attach to a director.

ICP227I CHPID *xx* IN CSS y HAS NOT BEEN DEFINED

Explanation: The PATH parameter of the CNTLUNIT statement contains an undefined channel path. To eliminate cascading error messages, IOCP issues this message only if no error has been found while processing CHPID statements.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: If the channel path attached to the control unit is not valid, specify the correct path to the control unit. If channel path *xx* in CSS *y* is valid, define the channel path before you refer to it in a CNTLUNIT statement.

ICP228I CUADD SPECIFIED FOR CONTROL UNIT ATTACHING TO TYPE=*xxx* CHPIDS

Explanation: The CUADD keyword was specified for a control unit attaching to TYPE=*xxx* channel paths. The CUADD keyword is valid only for control units that attach to CNC, CTC, FCV, FC, IQD, or OSD channel paths (TYPE keyword).

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Either delete the CUADD keyword from the CNTLUNIT statement or change the PATH keyword values so that the control unit attaches to channel paths which support the CUADD keyword.

ICP229I LINK KEYWORD SPECIFIED FOR CONTROL UNIT ATTACHING TO TYPE=*xxx* CHPIDS

Explanation: You specified the LINK keyword for a control unit that attaches to TYPE=*xxx* channel paths. You can specify the LINK keyword only for control units that attach to CVC, CBY, CNC, CTC, FCV, or FC channel paths (TYPE keyword).

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Either delete the LINK keyword from the CNTLUNIT statement or change the PATH keyword values so that the control unit attaches to channel paths which support the LINK keyword.

ICP230I CONTROL UNIT *xxxx* PREVIOUSLY DEFINED

Explanation: The user has defined a control unit (*xxxx*) to be added to the IOCDS, but an entry for control unit *xxxx* already exists.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Ensure that duplicate control unit numbers are not specified in the CNTLUNIT statements.

ICP231I MAXIMUM NUMBER OF CONTROL UNITS EXCEEDED

Explanation: You have exceeded the number of PCUs IOCP supports on your CPC. See “Machine Limits” on page F-3 to check the limits for your CPC.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Reduce the number of physical control units in your I/O configuration.

ICP232I DUPLICATE CHPID NUMBERS SPECIFIED IN CSS *x*

Explanation: An entry for a control unit to be added contains duplicate CHPIDs in CSS *x*.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Ensure that channel path identifiers are not duplicated in any CSS in the CNTLUNIT statement.

ICP233I UNIT ADDRESS SETS EITHER OVERLAP OR GENERATE HEX ADDRESS > FF

Explanation: An entry to add a control unit contains an incorrect unit address. The unit address (with the number of addresses) either exceeds FF (hex) or duplicates another unit address for the control unit.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Change the unit addresses specified in the UNITADD parameter so that they are correct.

ICP234I INVALID MIX OF CHPID TYPES WERE SPECIFIED FOR THIS CONTROL UNIT

Explanation: An entry for a control unit contains an incorrect mixture of channel path types (TYPE keyword). All channel path types attaching to a control unit must meet the following restrictions:

- All CBY or CVC
- All CNC, FCV, or FC
- CTC
- All CFS or CBS
- All CFP, CBP, or ICP
- OSC
- OSD
- OSE
- OSN
- FCP
- IQD

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Ensure that all of the channel paths attaching to the control unit are allowed to mix.

ICP235I TOO MANY CONTROL UNITS ASSIGNED TO THE CHANNEL PATH ASSOCIATED WITH CHPID *xx* IN CSS *y*

Explanation: The channel path associated with *chpid xx* in CSS *y* attaches to too many control units. A parallel channel path can attach to a maximum of 48 control units. CNC and CTC channel paths can attach to a maximum of 120 control units. IQD channel paths can attach to a maximum of 64 control units. OSD channel paths can attach to a maximum of 16 control units. FCV and FC channel paths can attach to a maximum of 256 control units. CFS, CFP, CBS, CBP, ICP, OSC, OSE, OSN, and FCP channel paths can attach only to one control unit.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Correct the I/O configuration so that no channel path attaches to more than the maximum number of control units allowed for its channel path type.

ICP236I ONLY ONE UNIT ADDRESS RANGE MAY BE SPECIFIED FOR CONTROL UNITS ATTACHING TO TYPE=*xxx* CHPIDS

Explanation: The CNTLUNIT statement contains more than one unit address or unit address range on the UNITADD keyword. Control units attaching to CNC, CTC, FCV, or FC channel paths can have only one range of unit addresses on the CNTLUNIT statement.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Specify only one unit address range for the control unit.

ICP237I ATTRIBUTES FOR ATTACHED CHPIDS ARE INCONSISTENT

Explanation: You have specified a mixture of shared and unshared channel paths in the PATH keyword of the CNTLUNIT statement. You cannot attach shared and unshared channel paths to the same control unit. A shared channel path has either the SHARED or NOTPART keyword specified in the CHPID statement or is spanned or has an access list of more than one logical partition specified in the PART or PARTITION keyword of the CHPID statement.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Ensure that the channel paths attaching to the control unit are either all shared or all unshared.

ICP238I UNIT ADDRESS LIMIT HAS BEEN EXCEEDED FOR THE CHANNEL PATH ASSOCIATED WITH CHPID *xx* IN CSS *y*

Explanation: The channel path associated with *chpid xx* in CSS *y* exceeded the maximum number of unit addresses (devices) allowed for an ESCON or FICON channel path. See Table F-2 on page F-3 to find the number of unit addresses (devices) for ESCON or FICON channel paths that your CPC supports.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Modify your I/O configuration so that the CNC, CTC, FCV, or FC channel path does not attach to more unit addresses than your CPC supports. You can accomplish this by either reducing the unit address counts of the control units attached to the channel path, or by reducing the number of control units to which the channel path is attached.

ICP239I TOO MANY CHPIDS ASSIGNED TO CONTROL UNIT

Explanation: A control unit attached to OSC, OSD, OSE, OSN, FCP, or IQD channel paths or an ESCON CTC or FICON CTC control unit can have only one channel path assigned to it in each CSS. IOCP defines an ESCON CTC control unit as either of the following:

- A control unit that attaches to only TYPE=CTC channel paths
- A control unit that attaches to only TYPE=CNC or TYPE= FCV channel paths and has UNIT=SCTC coded.

IOCP defines a FICON CTC control unit as a control unit that attaches to only TYPE=FC channel paths and has UNIT=FCTC coded.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Ensure that the control unit only attaches to one channel path per CSS if the control unit is an ESCON CTC or FICON CTC control unit or the control unit attaches to OSC, OSD, OSE, OSN, FCP, or IQD channel paths.

ICP240I **WARNING SHARED KEYWORD IGNORED FOR CONTROL UNITS ATTACHING TO NON-CVC CHPIDS**

Explanation: You specified the SHARED keyword in the CNTLUNIT statement for a control unit that attaches to a channel path type other than CVC. IOCP processes the SHARED keyword for control units that attach to only CVC channel paths. IOCP ignores the SHARED keyword for control units attached to any other type of channel path.

System Action: IOCP prints this warning message following the CNTLUNIT statement in question and continues processing.

Programmer Response: Either delete the SHARED keyword or change the channel path type.

ICP241I ****WARNING** PROTOCL KEYWORD IGNORED FOR CONTROL UNITS ATTACHING TO NON-CVC CHPIDS**

Explanation: You specified the PROTOCL keyword for a control unit that attaches to a channel path type other than CVC. IOCP processes the PROTOCL keyword for control units that attach to only CVC channel paths. IOCP ignores the PROTOCL keyword for control units attached to any other type of channel path.

System Action: IOCP prints this warning message following the CNTLUNIT statement in question and continues processing.

Programmer Response: Either delete the PROTOCL keyword or change the channel path type.

ICP242I **LINK ADDRESS** *xx* **ALREADY ESTABLISHED FOR CHPID** *yy* **IN CSS** *w* **BY CONTROL UNIT** *zzzz*

Explanation: A CVC or CBY channel path (TYPE keyword) cannot have more than one link address (LINK keyword) unless it attaches to an ESCON Director (SWITCH keyword). Channel path *yy* in CSS *w* does not attach to a director and has been assigned link address *xx* by control unit *zzzz*. Link address *xx* differs from the link address that was specified on the CNTLUNIT statement that is in error.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Remove all link addresses for the channel path, make all link addresses identical, or attach the channel path to a director.

ICP243I **CUADD INCONSISTENCY FOR LINK ADDRESS** *wwww* **ON CHPID** *xx* **IN CSS** *m* **WITH CONTROL UNIT** *yyyy* **DEFINED FOR CHPID** *zz* **IN CSS** *n*

Explanation: Two ESCON, FICON, IQD, or OSD control units have the same path (*css.chpid.link* or *switch.link)* but only one of the control units has a logical address (CUADD keyword). When a control unit logical address (CUADD keyword) is defined for a path (*css.chpid.link* or *switch.link)*, all other occurrences of the path must also have a control unit logical address.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Either add the CUADD keyword to all control units attaching to the *css.chpid.link* or *switch.link* in question or change the offending control unit so that it does not attach to the same *css.chpid.link* or *switch.link* as control unit *yyyy*.

ICP244I **CUADD ALREADY USED FOR LINK ADDRESS** *xxxx* **ON SWITCH** *yy* **BY CONTROL UNIT** *zzzz*

Explanation: Two ESCON or FICON control units have the same path (*switch.link*) through an ESCON or FICON Director (SWITCH keyword) and the same logical address (CUADD keyword). You cannot attach two ESCON or FICON control units to the same port on an ESCON or FICON Director and specify the same logical address for each control unit unless the channel paths are all the same type (TYPE keyword) or a mix of CNC and FCV channel paths and you are trying to define one of the following:

- ESCON CTC communications
- FICON CTC communications
- A single physical control unit as multiple control units for use by different logical partitions (LPs).

Note: Two control units can never have the same path (*css.chpid.link.cuadd*) for a given channel path.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Do one of the following:

- If you are defining two physical control units, correct the switch number or link address for one of the control units so that the control units attach to different ESCON or FICON Directors or different link addresses on the same director.
- If you are defining ESCON CTC or FICON CTC communications, ensure both control units are defined as ESCON CTC or FICON CTC control units (See “IOCP Definitions” on page 2-5) and that the channel paths are all the same type or a mix of CNC and FCV channel paths.

- If you are defining a single physical control unit as multiple control units for use by different LPs, ensure that the control units have the same unit address ranges, the channel paths in each control unit are all the same type or all CNC and FCV, and none of the paths attaching to the different control units belong to the same LP. The logical partition intersection test is based on the initial access lists of the channel paths attaching to the control units.
- If you are defining a control unit that supports logical addressing, change the CUADD keyword values to the unique logical addresses that your control unit supports. Ensure that the channel paths in each control unit are the same type or a mix of CNC and FCV channel paths.

Note: Not all ESCON and FICON control units support logical addressing.

ICP245I THERE IS NOT A 1-TO-1 CORRESPONDENCE BETWEEN CHPIDS AND LINK ADDRESSES IN CSS *x*

Explanation: The LINK parameter for CSS *x* on the CNTLUNIT statement does not contain the same number of link addresses as the PATH parameter for CSS *x* contains channel paths. The number of channel paths must be the same as the number of link addresses in a CSS.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Ensure that you have entered a valid link address or ** for every channel path in the PATH parameter for the CSS. Ensure that there are no extraneous channel paths in the PATH parameter and also that there are no extraneous link addresses in the LINK parameter. Add or remove link addresses or channel paths as necessary.

ICP246I LINK ADDRESS *xxxx* **ALREADY USED FOR SWITCH** *yy* **BY CONTROL UNIT** *zzzz*

Explanation: One of the two following conditions exists:

- You have assigned both a parallel and an ESCON control unit to the same switch.link (*yy.xx*). You cannot attach parallel and ESCON control units to the same port on an ESCON Director.
- You have assigned two ESCON or FICON control units to the same switch.link (*yy.xx* or *yy.xxxx*). You can only define ESCON or FICON control units to the same port on an ESCON or FICON Director if the channel paths are all the same type or a mix of CNC and FCV channel paths and you are trying to define one of the following:
  - ESCON CTC communications
  - FICON CTC communications
  - A single physical control unit as multiple control units for use by different logical partitions (LPs)
  - A control unit that supports logical addressing (CUADD keyword)

Note: Two control units can never have the same path (*css.chpid.link.cuadd*) for a given channel path.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: For condition 1, do one of the following:

- Attach one of the control units to a different director or link.
- Change the types of channel paths to the control units so that they are all parallel or all CNC, CTC, and FCV.

For condition 2, do one of the following:

- If you are defining two physical control units, correct the switch number or link address for one of the control units so that the control units attach to different ESCON or FICON Directors or different link addresses on the same director.
- If you are defining ESCON CTC or FICON CTC communications, ensure both control units are defined as ESCON CTC or FICON CTC control units (see “IOCP Definitions” on page 2-5) and that all channel paths are the same type or a mix of CNC and FCV channel paths.
- If you are defining a single physical control unit as multiple control units for use by different logical partitions (LPs), ensure that the control units have the same unit address ranges, the channel paths in each control unit are all the same type or a mix of CNC and FCV channel paths, and none of the paths attaching to the different control units belongs to the same logical partition. The logical partition intersection test is based on the initial access lists of the channel paths attaching to the control units.

- If you are defining a control unit that supports logical addressing, specify the unique logical addresses that your control unit supports using the CUADD keyword on each of the CNTLUNIT statements and ensure that the channel paths in each control unit are all the same type.

Note: Not all ESCON and FICON control units support logical addressing.

ICP247I UNIT ADDRESS *xx* ALREADY RECOGNIZED BY CONTROL UNIT *yyyy* FOR LINK ADDRESS *zz* ON SWITCH *ww*

Explanation: Two parallel control units both attach to the same path (*switch.link*) and have a unit address in common. Unit address values for the control units must be unique. CVC and CBY control units that attach to the same switch.link must be daisy-chained. All daisy-chained control units must have unique unit addresses.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Either change the UNITADD keyword values so that they are unique or attach one of the control units to a different director or link.

ICP248I CUADD ALREADY USED BY CONTROL UNIT *xxxx* FOR THE CHANNEL PATH ASSOCIATED WITH CHPID *yy* IN CSS *z*

Explanation: Two ESCON, FICON, IQD, or OSD control units both attach to the same channel path associated with *chpid yy* in CSS *z* and the same logical address (CUADD keyword). The CUADD values must be different. This ensures that the combination *css.chpid.cuadd* is unique for all control units.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Change the CUADD keyword values so that they are unique.

ICP249I **WARNING UNITADD KEYWORD IGNORED FOR CONTROL UNITS ATTACHING TO TYPE=*xxx* CHPIDS**

Explanation: You specified the UNITADD keyword for a control unit that attaches to TYPE=*xxx* channel paths. IOCP ignores the UNITADD keyword for control units that attach to CFS, CFP, CBS, CBP, ICP, OSC, OSD, OSE, OSN, FCP, or IQD channel paths.

System Action: IOCP prints this warning message following the CNTLUNIT statement in question and continues processing.

Programmer Response: Either delete the UNITADD keyword or change the channel path type.

ICP250I A CONTROL UNIT CANNOT ATTACH TO TYPE=*xxx* CHPIDS

Explanation: You specified a control unit that attaches to TYPE=*xxx* channel paths. You cannot attach a control unit to CFR or CBR channel paths. CFR or CBR channel paths do not require CNTLUNIT or IODEVICE statements.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Either delete the CNTLUNIT statement or change the channel path type.

ICP251I INVALID CUADD VALUE SPECIFIED FOR CONTROL UNIT ATTACHING TO TYPE=*xxx* CHPIDS

Explanation: You specified an incorrect control unit logical address (CUADD keyword) for a control unit that attaches to TYPE=*xxx* channel paths. CNC, CTC, and FCV channel paths must have a CUADD value in the range 00-0F. FC, IQD, and OSD channel paths must have a CUADD value in the range of 00-FF. However, if FC channel paths are mixed with CNC or FCV channel paths, the CUADD value must be in the range 00-0F.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Either correct the CUADD keyword value or change the channel path type.

ICP252I INVALID LINK ADDRESS *xxxx* SPECIFIED FOR CONTROL UNIT ATTACHING TO TYPE=*yyy* CHPIDS

Explanation: You specified an incorrect link address (*xxxx*) for a control unit that attaches to TYPE=*yyy* channel paths. The valid link address range is 01-FE for CBY, CVC, CNC, CTC, and FCV channel paths. The valid link address range is 0000-FFFF for an FC channel path.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Either correct the LINK keyword value or change the channel path type.

ICP253I LINK ADDRESS MUST NOT BE SPECIFIED. CHPID *xx* IN CSS *y* DOES NOT ATTACH TO A SWITCH

Explanation: You specified a link address other than two or four asterisks (** or ****) for channel path *xx* in CSS *y*, which does not attach to a switch. FC channel paths (TYPE keyword) that do not attach to a switch must either have no link address or a link address of asterisks.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Delete the LINK keyword or specify a link address of two asterisks for all FC channel paths that do not attach to a switch.

ICP254I UNIT=FCTC INVALID FOR CONTROL UNITS ATTACHING TO TYPE=*xxx* CHPIDS

Explanation: You specified control unit type FCTC for a control unit attached to TYPE=*xxx* channel paths. FCTC is used to specify a FICON CTC control unit. FICON CTC control units require FC channel paths.

System Action: IOCP prints this warning message following the CNTLUNIT statement in question and continues processing.

Programmer Response: Change the UNIT keyword value or attach the control unit to only FC channel paths.

ICP255I LINK *xxxx* IS INCONSISTENT WITH A ONE-BYTE | TWO-BYTE LINK ALREADY SPECIFIED FOR THE CHANNEL PATH ASSOCIATED WITH CHPID *yy* IN CSS *z*

Explanation: You specified link address *xxxx*, which is inconsistent with a link address already specified for the channel path associated with *chpid yy* in CSS *z*. Link addresses for an FC channel path (TYPE keyword) must be all one-byte (two-digit) or two-byte (four-digit) values.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Change the link address values for the FC channel path so that they are all the same size. See “Defining FICON Switch Configurations” on page 1-30 for more information on specifying link addresses for FC channel paths.

ICP256I INCOMPATIBLE CONTROL UNIT TYPES FOR THE CHANNEL PATH ASSOCIATED WITH CHPID *xx* IN CSS *y*

Explanation: The two control units on the channel path associated with *chpid xx* in CSS *y* are incompatible. One is a FICON CTC control unit and the other is not. For FC channel paths that do not attach to a switch, all the control units on the channel path must either be FICON CTC control units or none of them can be FICON CTC control units. IOCP defines a FICON CTC control unit as a control unit that attaches to only TYPE=FC channel paths and has UNIT=FCTC coded.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Ensure all the control units on the FC channel path are FCTC or none of them are FCTC.

ICP300I UNIT ADDRESS EXCEEDS HEX ADDRESS FF

Explanation: The keyword value for the unit address (specified in either the UNITADD or the ADDRESS keyword in the IODEVICE statement) plus the keyword value for count (specified in the ADDRESS keyword), minus one, exceeds the maximum allowable value of hexadecimal FF for a unit address.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Correct the keyword values.

ICP301I DEVICE *xxxx* HAS EXCEEDED THE MAXIMUM NUMBER OF I/O DEVICES ALLOWED FOR SUBCHANNEL SET *z* IN CSS *y*

Explanation: Device number *xxxx* has exceeded the maximum number of I/O devices supported in subchannel set *z* in CSS *y*. For a dynamic-capable IOCDS, IOCP enforces the MAXDEV keyword value specified for subchannel set *z* in CSS *y*. If no value was specified or this is not a dynamic-capable IOCDS, IOCP enforces the subchannel set device limit supported by the CPC. See “Machine Limits” on page F-3 to check the device limits the CPC supports.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Do one or both of the following:

- Reduce the number of I/O devices in the configuration for the subchannel set for the CSS
- For a dynamic-capable IOCDS, increase the value specified with the MAXDEV keyword for the subchannel set for the CSS up to the device limit the CPC supports.

ICP302I DUPLICATE CONTROL UNIT NUMBERS SPECIFIED

Explanation: An I/O device contains duplicate control unit numbers.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Ensure that control unit numbers are not duplicated in the IODEVICE statement.

ICP303I UNIT ADDRESS *yy* DOES NOT EXIST IN CONTROL UNIT *xxxx*

Explanation: An I/O device contains unit address *yy*, which does not exist in the range of unit addresses for control unit *xxxx*.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Ensure that the correct range of unit addresses is specified in the CNTLUNIT statement and the IODEVICE statement. Control units attaching to some channel path types (for example OSD channel paths) have a fixed unit address range that requires you to correct the range of unit addresses specified in the IODEVICE statement.

ICP304I TOO MANY CHPIDS ASSIGNED TO I/O DEVICE IN CSS *x*

Explanation: You have assigned too many channel paths in CSS *x* to the I/O device based on the channel paths in CSS *x* in the control units that attach to the device. You can assign a maximum of eight channel paths to a device in a CSS.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Modify the I/O configuration so that the device does not attach to too many paths in any CSS.

ICP305I ATTRIBUTES FOR ATTACHED CONTROL UNITS ARE INCONSISTENT

Explanation: An I/O device has specified two or more control units and the control units do not have the same protocol or are not the same type (1 or 2).

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Ensure that the control units are correctly specified in the CNTLUNIT statements and that the I/O device is correctly specified in the IODEVICE statement.

ICP306I I/O DEVICE CONNECTED TO MORE THAN ONE CONTROL UNIT ON CHPID *xx* IN CSS *y*

Explanation: An I/O device has specified two or more control units and two or more of the control units are attached to the same channel path *xx* in CSS *y*. When a device is assigned to more than one control unit, each control unit must be attached to a different channel path in a CSS.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Ensure that the control units are correctly specified in the CNTLUNIT statements and that the I/O device is correctly specified in the IODEVICE statement.

ICP307I NO PATH TO CHPID *xx* IN CSS *y* FOR THIS DEVICE

Explanation: IOCP did not find a path from the device to the channel path that was specified by the PATH value in the IODEVICE statement.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Ensure that the value specified in the PATH parameter is correct. Check the associated CNTLUNIT and CHPID statements to ensure that there is a path from the device through a control unit to the specified channel path and CSS.

ICP308I CONTROL UNIT NUMBER *xxxx* HAS NOT BEEN DEFINED

Explanation: Control unit *xxxx* has not been defined by a CNTLUNIT statement. To eliminate cascading error messages, IOCP issues this message only if no error has been found while processing CHPID and CNTLUNIT statements.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Define control unit *xxxx* before the control unit is referred to in an IODEVICE statement.

ICP309I NONE OF THE PARTITIONS IN THE DEVICE CANDIDATE LIST IN CSS *x* CAN BE ACCESSED BY THE CHPIDS ASSIGNED TO THIS DEVICE

Explanation: You specified the PART, PARTITION, or NOTPART keyword in the IODEVICE statement for this device but none of the logical partitions (LPs) in the device candidate list in CSS *x* can be accessed by the channel paths in CSS *x* assigned to this device. This indicates that there is no match between the LPs in the combined candidate lists of the channel paths assigned to the device and the LPs in the device candidate list. If there is no match, there can be no channel path access to the device in the CSS.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Ensure that the PART, PARTITION, or NOTPART keyword in the IODEVICE statement generates a device candidate list with at least one LP that is also in the candidate list of one of the channel paths assigned to the device for the CSS.

ICP310I ***WARNING TIMEOUT KEYWORD IGNORED FOR DEVICES ASSIGNED TO NON-CVC CHPIDS**

Explanation: You specified the TIMEOUT keyword in the IODEVICE statement for a device assigned to channel paths that are not CVC (TYPE keyword). IOCP processes the TIMEOUT keyword for devices assigned to only CVC channel paths. IOCP ignores the TIMEOUT keyword for devices assigned to any other type of channel path.

System Action: IOCP prints this warning message following the IODEVICE statement in question and continues processing.

Programmer Response: Either delete the TIMEOUT keyword or change the channel path type.

ICP311I CONTROL UNITS FOR THIS DEVICE CONTAIN AN INVALID MIX OF CHPID TYPES

Explanation: An entry for an I/O device contains an incorrect mix of channel path types (TYPE keyword) that are associated with two or more control units. All channel path types assigned to a device must meet the following restrictions:

- All CBY or CVC
- All CNC or FCV or FC
- CTC
- All CFS or CBS
- All CFP or CBP or ICP
- OSC
- OSD
- OSE
- OSN
- FCP
- IQD

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Ensure that all channel paths attaching to control units for the I/O device are allowed to mix.

ICP312I TOO MANY CONTROL UNITS ASSIGNED TO DEVICE

Explanation: The device is attached to more than one control unit and one of the control units is either an ESCON CTC or FICON CTC control unit or a control unit attached to CFS, CFP, CBS, CBP, ICP, OSC, OSD, OSE, OSN, FCP, or IQD channel paths. A device can only attach to one control unit when the control unit is an ESCON CTC or FICON CTC control unit or when the control unit attaches to CFS, CFP, CBS, CBP, ICP, OSC, OSD, OSE, OSN, FCP, or IQD channel paths.

An ESCON CTC control unit is defined as one of the following:

- A control unit that attaches to only TYPE=CTC channel paths
- A control unit that attaches to only TYPE=CNC or TYPE= FCV channel paths and has UNIT=SCTC coded.

A FICON CTC control unit is defined as a control unit that attaches to only TYPE=FC channel paths and has UNIT=FCTC coded.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: If the device is meant to attach to an ESCON CTC or FICON CTC control unit or to a control unit attached to CFS, CFP, CBS, CBP, ICP, OSC, OSD, OSE, OSN, FCP, or IQD channel paths, delete all other control units from the IODEVICE statement. Otherwise, delete the ESCON CTC or FICON CTC control unit or the control unit attached to the CFS, CFP, CBS, CBP, ICP, OSC, OSD, OSE, OSN, FCP, or IQD channel paths from the IODEVICE statement.

ICP313I ATTRIBUTES FOR CHPIDS ASSIGNED TO THIS DEVICE ARE INCONSISTENT

Explanation: You have specified control units in the CUNUMBR keyword of the IODEVICE statement that attach to a mixture of shared and unshared channel paths. You cannot assign shared and unshared channel paths to the same device. A shared channel path has either the SHARED or NOTPART keyword specified in the CHPID statement or is spanned or has an access list of more than one logical partition specified in the PART or PARTITION keyword of the CHPID statement.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Ensure that the channel paths attaching to the control units for the device are either all shared or all unshared.

ICP314I **CAUTION DEVICE CANNOT BE ACCESSED BY PARTITION *xxxxxxxx* IN CSS *y***

Explanation: You specified the PART, PARTITION, or NOTPART keyword in the IODEVICE statement and logical partition *xxxxxxxx* is in the device candidate list for CSS *y*. However, the logical partition (LP) cannot access the device because none of the channel paths in CSS *y* assigned to the device have access to the LP. That is, none of the channel paths assigned to the device have the LP in their *chpid* candidate lists for CSS *y*.

System Action: IOCP prints this caution message following the IODEVICE statement in question and continues processing.

Programmer Response: Ensure that the LP name belongs in the device candidate list and that the channel paths assigned to the device are not to have access to the LP.

ICP315I NOTPART AND PARTITION KEYWORDS ARE NOT ALLOWED FOR DEVICES ASSIGNED TO UNSHARED CHPIDS

Explanation: You specified the PART, PARTITION, or NOTPART keyword in the IODEVICE statement of a device that is assigned to unshared channel paths. You can specify only the PART, PARTITION, or NOTPART keyword in the IODEVICE statement for devices assigned to shared channel paths. A shared channel path has either the SHARED or NOTPART keyword specified in the CHPID statement or is spanned or has an access list of more than one logical partition in the PART or PARTITION keyword of the CHPID statement.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Either delete the PART, PARTITION, or NOTPART keyword in the IODEVICE statement or assign the device to shared channel paths. Note that you cannot mix shared and unshared channel paths to the same device.

ICP316I **WARNING PATH KEYWORD IGNORED FOR DEVICES ASSIGNED TO TYPE=*xxx* CHPIDS**

Explanation: You specified the PATH keyword in the IODEVICE statement for a device assigned to TYPE=*xxx* channel paths. The PATH keyword is meaningful only for devices assigned to CBY, CVC, CNC, FCV, or FC channel paths. IOCP ignores the PATH keyword for all other channel path types.

System Action: IOCP prints this warning message following the IODEVICE statement in question and continues processing.

Programmer Response: Either delete the PATH keyword in the IODEVICE statement or change the channel path type.

ICP317I **WARNING STADET KEYWORD IGNORED FOR DEVICES ASSIGNED TO TYPE=*xxx* CHPIDS**

Explanation: You specified the STADET keyword in the IODEVICE statement for a device assigned to TYPE=*xxx* channel paths. The STADET keyword is meaningful only for devices assigned to CBY, CVC, CNC, CTC, FCV, or FC channel paths. IOCP ignores the STADET keyword for all other channel path types.

System Action: IOCP prints this warning message following the IODEVICE statement in question and continues processing.

Programmer Response: Either delete the STADET keyword in the IODEVICE statement or change the channel path type.

ICP318I NOTPART AND PARTITION KEYWORDS ARE NOT ALLOWED FOR DEVICES ASSIGNED TO TYPE=*xxx* CHPIDS

Explanation: You specified the NOTPART, PART or PARTITION keyword in the IODEVICE statement for a device assigned to TYPE=*xxx* channel paths. The NOTPART and PART or PARTITION keywords in the IODEVICE statement are allowed only for CNC, CTC, OSC, OSD, OSE, OSN, FCV, FC, FCP, and IQD channel paths.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Either delete the NOTPART or PART or PARTITION keyword in the IODEVICE statement or change the channel path type.

ICP319I **WARNING UNITADD KEYWORD IGNORED FOR DEVICES ASSIGNED TO TYPE=*xxx* CHPIDS**

Explanation: You specified the UNITADD keyword in the IODEVICE statement for a device assigned to TYPE=*xxx* channel paths. IOCP ignores the UNITADD keyword for devices assigned to CFS, CFP, CBS, CBP, or ICP channel paths.

System Action: IOCP prints this warning message following the IODEVICE statement in question and continues processing.

Programmer Response: Either delete the UNITADD keyword in the IODEVICE statement or change the channel path type.

ICP320I **WARNING UNIT=*xxxx* EXPECTED FOR DEVICES WITH UNIT ADDRESS *yy* ASSIGNED TO TYPE=*zzz* CHPIDS**

Explanation: You specified a device type other than *xxxx* (UNIT keyword) for a device with unit address *yy* and assigned to TYPE=*zzz* channel paths. For OSD and OSE channel paths, IOCP expects devices with unit addresses in the range 00-FD to have a value of OSA and the device with unit address FE to have a value of OSAD. For OSN channel paths, IOCP expects the device with unit address FE to have a value of OSAD.

System Action: IOCP prints this warning message following the IODEVICE statement in question and continues processing.

Programmer Response: Change the UNIT keyword value.

ICP321I DEVICE CANNOT BE ACCESSED BY CSS *x*

Explanation: You specified CSS *x* in the PATH, PART, PARTITION, or NOTPART keyword in the IODEVICE statement. However, none of the control units attached to the device have channel paths in that CSS.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Ensure that the CSS ID specified is correct. Check the associated CNTLUNIT and CHPID statements to ensure that there is a channel path from the CSS through a control unit to the device.

ICP322I NULL DEVICE CANDIDATE LIST SPECIFIED FOR EACH CSS

Explanation: You specified a null device candidate list for every CSS to which this device has access. A device must be accessible by at least one CSS.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Either delete the device or modify the device candidate list so that at least one CSS can access the device.

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ICP322I NULL DEVICE CANDIDATE LIST SPECIFIED IN CSS *x*

Explanation: You cannot specify a null device candidate list for a device. You generated the null device candidate list by specifying all logical partitions (LPs) in the configuration in the device candidate list parameter of the NOTPART keyword in CSS *x* for the device. A device requires at least one LP in its generated device candidate list for each CSS for which it has channel paths.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Delete one or more of the LP names in the CSS from the device candidate list parameter of the NOTPART keyword in the IODEVICE statement.

ICP323I ****CAUTION** DEVICE WITH UNIT ADDRESS FE REQUIRES A CONTROL UNIT WITH CUADD=0 TO BE USABLE**

Explanation: You specified a device with unit address FE on a control unit with a non-zero CUADD keyword value. For an OSD channel path, the device with unit address FE (usually specified with UNIT=OSAD on the IODEVICE statement) can be used only when specified for a control unit without the CUADD keyword or with a CUADD keyword value of zero.

System Action: IOCP prints this caution message following the IODEVICE statement in question and continues processing.

Programmer Response: Ensure that devices with unit address FE on OSD channel paths are only assigned to control units without the CUADD keyword or with a CUADD keyword value of zero.

ICP324I **DEVICE CANDIDATE LIST PREVENTS CONTROL UNIT *xxxx* FROM ACCESSING DEVICE**

Explanation: You specified a null device candidate list for every CSS with access to control unit *xxxx*. Therefore, the control unit cannot access the device. Each control unit assigned to the device must be able to access the device.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Either remove the control unit from the CUNUMBR keyword for the device or modify the device candidate list so that the control unit can access the device from at least one CSS.

ICP325I **DEVICES ASSIGNED TO TYPE=*xxx* CHPIDS CANNOT BE DEFINED IN SUBCHANNEL SET *y***

Explanation: You specified subchannel set *y* in the SCHSET keyword in the IODEVICE statement for a device assigned to TYPE=*xxx* channel paths. You can specify only subchannel set 0 for devices assigned to CBY, CVC, CFS, CFP, CBS, CBP, and ICP.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Do one of the following:

- Delete the SCHSET keyword in the IODEVICE statement
- Specify only subchannel set ID 0
- Change the channel path type.

ICP326I UNIT=*xxxxxxxx* IS NOT ALLOWED FOR DEVICES WITH UNIT ADDRESS *yy* ASSIGNED TO TYPE=*zzz* CHPIDS

Explanation: You specified device type *xxxxxxxx* (UNIT keyword) for a device with unit address *yy* and assigned to TYPE=*zzz* channel paths. For OSN channel paths, IOCP requires devices with unit addresses in the range 00-FD to have a value of OSN or 3745.

System Action: IOCP continues to validate and check the syntax of the remaining statements. However, it does not generate an IOCDS and it does not produce configuration reports.

Programmer Response: Change the UNIT keyword value.

ICP327I **WARNING NULL DEVICE CANDIDATE LIST SPECIFIED FOR CSS *x* SO THE CSS IS IGNORED BY OTHER KEYWORDS**

Explanation: You specified CSS *x* in the PATH or SCHSET keyword in the IODEVICE statement. However, you specified a null device candidate list with the PART, PARTITION, or NOTPART keyword in the IODEVICE statement for that same CSS, which prevents the device from being defined in that CSS. Therefore, IOCP ignores any CSS *x* parameters for the PATH and SCHSET keywords for the IODEVICE statement.

System Action: IOCP prints this warning message following the IODEVICE statement in question and continues processing.

Programmer Response: Either correct the CSS parameter in the PATH or SCHSET keyword, or do not specify a null device candidate list for the CSS.

ICP350I MINIMUM CONFIGURATION WAS NOT DEFINED

Explanation: To generate an IOCDS, ICP IOCP 1.1.0 requires the following:

- For a dynamic-capable configuration (a configuration built by HCD or by specifying IOCP CMS utility option DYN for VM), the following must be true:
  - At least one logical partition must have a device defined on a CVC, CBY, CNC, FCV, FC, or FCP channel path (TYPE keyword) or
  - If no device is defined on one of the above channel path types, all logical channel subsystems (CSSs) must have an external coupling link capable of receiving messages defined (CFR, CFP, CBR, or CBP channel path)
  - For a configuration that is not dynamic-capable, one of the following must be true for each defined CSS:
    - A device is defined on a CVC, CBY, CNC, FCV, FC, or FCP channel path (TYPE keyword)
    - An external coupling link capable of receiving messages is defined (CFR, CFP, CBR, or CBP channel path)
    - An internal coupling link is defined (ICP channel path). But at least one CSS must have a device defined on a CVC, CBY, CNC, FCV, FC, or FCP channel path (TYPE keyword).

System Action: IOCP does not complete the generation of an IOCDS and does not produce configuration reports.

Programmer Response: Ensure that a minimum configuration is defined.

ICP351I ATTEMPTED TO ASSIGN PHYSICAL CONTROL UNIT *xxxx* TO TWO CONTROL UNIT HEADERS

Explanation: IOCP attempted to assign physical control unit *xxxx* to two control unit headers. A logical error has occurred in IOCP.

System Action: IOCP does not complete the generation of an IOCDS and does not produce configuration reports.

Programmer Response: Analyze the control unit header that contains the physical control unit. If the control unit header is valid, save the console sheet and all associated output and notify your service representative.

ICP352I DEVICE NUMBER *wwww* IN SUBCHANNEL SET *n* DUPLICATES UNIT ADDRESS *xx* IN CSS *z* ON CONTROL UNIT *yyyy*

Explanation: When processing device number *wwww* in subchannel set *n*, IOCP detected unit address *xx* duplicated on control unit *yyyy* in CSS *z*. This error occurs if two or more devices with the same unit address are assigned to the same control unit in the same CSS.

System Action: IOCP does not complete the generation of an IOCDS and does not produce configuration reports.

Programmer Response: Ensure that unit addresses are not duplicated in the same CSS in IODEVICE statements that attach to control unit *yyyy*.

ICP353I IOCP HAS GENERATED *xxxxx* CONTROL UNIT HEADERS FOR CSS *y* WHICH EXCEEDS THE MAXIMUM NUMBER ALLOWED

Explanation: IOCP tried to generate more control unit headers (CUHs) in a CSS than your CPC supports. Review the limits and rules for the generation of CUHs for your CPC. See "Machine Limits" on page F-3 to verify what your CPC supports.

System Action: IOCP does not complete the generation of an IOCDS and does not produce configuration reports.

Programmer Response: Ensure that the configuration does not exceed the maximum number of CUHs for a CSS. You may need to reduce the number of physical control units or have more control units share devices.

ICP354I **CAUTION MINIMUM NUMBER OF DEVICES HAVE NOT BEEN DEFINED FOR [CHPID *xx* IN CSS *y* | THE CHANNEL PATHS IN CSS *x* IN CONTROL UNIT *yyyy*]**

Explanation: You did not define the minimum number of devices recommended for a coupling facility channel path or control unit. CFP, CBP, and ICP channel paths (TYPE keyword) assigned to a control unit should have a minimum of 7 devices each. CFS and CBS channel paths should have a minimum of 2 devices each. If the message is for channel path *xx* in CSS *y*, the channel path is a CFS or CBS channel path and does not have a control unit. If the message is for the channel paths in CSS *x* in control unit *yyyy*, the minimum number of devices necessary to fully support the channel paths in CSS *x* in the control unit were not defined.

System Action: IOCP prints this caution message and continues processing.

Programmer Response: Define the minimum number of devices recommended for the channel path type for either the channel path or the CSS in the control unit.

ICP355I CHANNEL PATH ASSOCIATED WITH CHPID *xx* IN CSS *y* HAS *zzzzz* VALID SUBCHANNELS WHICH EXCEEDS MAXIMUM ALLOWED [FOR {OSN | 3745} DEVICES]

Explanation: You specified too many valid subchannels for channel path *xx* in CSS *y*. Valid subchannels are devices which are defined to a logical partition and permitted for use by the logical partition. Valid subchannels are calculated as follows:

- For unshared channel paths, each device defined in IOCP represents a single valid subchannel.
- For shared channel paths, each device defined in IOCP represents multiple valid subchannels based on the total number of logical partitions (LPs) in its device candidate list.

One of the following conditions exists:

- You defined too many OSA valid subchannels on an OSD channel path. A maximum of 480 OSA valid subchannels can be defined on an OSD channel path when priority specification is enabled (for example, CHPARM=00 is specified on CHPID statement). A maximum of 1920 OSA valid subchannels can be defined on an OSD channel path when priority specification is disabled (for example, CHPARM=02 is specified). An OSA subchannel is a device with a unit address in the range 00-FD. The device with unit address FE (OSAD) is excluded from the maximum.
- You defined too many OSN or 3745 valid subchannels on an OSN channel path. A maximum of 480 OSN valid subchannels and 180 3745 valid subchannels can be defined on an OSN channel path. OSN subchannels are defined with UNIT=OSN on the IODEVICE statement, and 3745 subchannels are defined with UNIT=3745. Valid subchannels are devices with unit addresses in the range 00-FD. The OSAD device with unit address FE is excluded from the maximums
- You defined too many valid subchannels on an FCP channel path. A maximum of 480 valid subchannels can be defined on an FCP channel path.

System Action: IOCP does not complete the generation of an IOCDS and does not produce configuration reports.

Programmer Response: For an unshared channel path, reduce the number of devices defined on the FCP channel path or defined on the OSD or OSN channel path with unit addresses in the range 00-FD. For a shared channel path, do one or both of the following:

- Reduce the number of devices defined on the FCP channel or defined on the OSD or OSN channel path with unit addresses in the range 00-FD.

- Specify device candidate lists with fewer logical partitions for the devices defined on the FCP channel or defined on the OSD or OSN channel path with unit addresses in the range 00-FD. For devices assigned to OSN channel paths, specify device candidate lists that restrict the OSN devices to CCL images and the 3745 devices to operating system images.

For an OSD channel path on an OSA-Express2 feature, if you want to disable priority specification to increase the maximum number of valid subchannels available on the channel, specify the appropriate CHPARM keyword value for the OSD channel path (for example, CHPARM=02).

ICP356I IOCP HAS GENERATED *xxxxxx* VALID SUBCHANNELS FOR TYPE=IQD CHPIDS WHICH EXCEEDS THE MAXIMUM NUMBER ALLOWED

Explanation: You specified too many valid subchannels for all TYPE=IQD channel paths in your configuration. A maximum of 12288 valid subchannels can be defined on all IQD channel paths. Valid subchannels are devices that are defined to a logical partition and permitted for use by the logical partition. Valid subchannels are calculated as follows:

- For unshared channel paths, each device defined in IOCP represents a single valid subchannel.
- For shared channel paths, each device defined in IOCP represents multiple valid subchannels based on the total number of logical partitions (LPs) in its device candidate list.

System Action: IOCP does not complete the generation of an IOCDS and does not produce configuration reports.

Programmer Response: For unshared channel paths, reduce the number of devices defined on IQD channel paths. For shared IQD channel paths, do one or both of the following:

- Reduce the number of devices defined.
- Specify device candidate lists with fewer logical partitions for the devices defined.

ICP357I TOO MANY LINK ADDRESSES ASSIGNED TO THE CHANNEL PATH ASSOCIATED WITH CHPID *xx* IN CSS *y*

Explanation: You have assigned too many link addresses to channel path *xx* in CSS *y*. Central processor complexes limit the number of link addresses you can assign to CNC, CTC, FCV, and FC channel paths. See “Machine Limits” on page F-3 to verify what your CPC supports.

System Action: IOCP does not complete the generation of an IOCDS and does not produce configuration reports.

Programmer Response: Reduce the number of link addresses to which channel path *xx* is assigned.

ICP358I CONTROL UNIT *xxxx* DUPLICATES UNIT ADDRESS *yy* ON CHPID *zz* IN CSS *w*

Explanation: When processing control unit *xxxx*, IOCP detected unit address *yy* duplicated on parallel channel path *zz* in CSS *w*. This error occurs if two or more control units with the same unit address attach to the same parallel channel path.

System Action: IOCP does not complete the generation of an IOCDS and does not produce configuration reports.

Programmer Response: Ensure that control unit *xxxx* does not duplicate unit addresses for parallel channel path *zz*.

ICP359I TOO MANY UNIT ADDRESS RANGES ASSIGNED TO THE CHANNEL PATH ASSOCIATED WITH CHPID *xx* IN CSS *y*

Explanation: One of the following conditions exist:

- Channel path *xx* in CSS *y* is a CBY or CVC channel path and has exceeded the maximum number of unit address ranges allowed for the channel path. The maximum number of unit address ranges for CNTLUNIT statements that attach to a CBY or CVC channel path is 64.
- The maximum number of unit address ranges for control units that attach to shared CTC channel paths (SHARED keyword on CHPID statement) is 120. IOCP may generate more unit address ranges for control units attaching to shared CTC channel paths than for other channel path types or unshared CTC channel paths. See “Shared ESCON CTC Considerations” on page 1-17 for more information.
- Channel path *xx* in CSS *y* is a spanned FC channel path (PATH keyword in the CHPID statement) and has exceeded the maximum number of unit address ranges allowed for the channel path. The maximum number of unit

address ranges for CNTLUNIT statements that attach to an FC channel path is 256. IOCP may generate more unit address ranges for a spanned FC channel path than for an unspanned channel path. See “FC Control Unit Definition Considerations” on page on page 2-34. Note that CSS *y* will always be the lowest CSS ID number for the channel path and is not the only CSS that caused the error.

System Action: IOCP does not complete the generation of an IOCDS and does not produce configuration reports.

Programmer Response: For a CBY or CVC channel path, reduce or consolidate the unit address ranges for CNTLUNIT statements attached to channel path *xx* in CSS *y*. For a shared CTC channel path, do one or more of the following:

- Reduce the number of control units attached to channel path *xx*
- For the devices assigned to channel path *xx*, reduce the number of logical partitions (LPs) in their device candidate lists (PART, PARTITION, or NOTPART keyword on IODEVICE statement). The default device candidate list for a device assigned to a shared CTC channel path contains all the LPs in the candidate list of the CTC channel path. Specify a subset of these LPs in the PART, PARTITION, or NOTPART keyword in the IODEVICE statements for each device attaching to the same control unit.

For an FC channel path, do one or more of the following:

- Reduce the number of control units attached to channel path *xx*
- Use the same link address in each CSS of a control unit for channel path *xx*.

ICP360I UNIT ADDRESS LIMIT FOR THE CHANNEL PATH ASSOCIATED WITH CHPID *xx* IN CSS *y* HAS BEEN EXCEEDED

Explanation: The maximum number of unit addresses (UNITADD keyword on CNTLUNIT statement) for the control units that attach to FCV or FC channel path *xx* or shared CTC path *xx* has been exceeded. See Appendix F, “Machine Limits and Rules,” on page F-1 to check the device (unit address) limit allowed for FCV, FC, or CTC channel paths for your CPC.

IOCP may generate more unit addresses for physical control units attaching to shared CTC channel paths than for other channel path types or unshared channel paths. See “Shared ESCON CTC Considerations” on page 1-17 for more information.

IOCP may generate more unit addresses for a spanned FC channel path (PATH keyword in the CHPID statement) than for an unspanned channel path. See “FC Control Unit Definition Considerations” on page 2-34. Note that CSS *y* will always be the lowest CSS ID number for the channel path and is not the only CSS that caused the error.

System Action: IOCP does not complete the generation of an IOCDS and does not produce configuration reports.

Programmer Response: Do one or more of the following:

- Reduce the unit address counts of the control units attached to channel path *xx* in CSS *y*
- Reduce the number of control units attached to channel path *xx* in CSS *y*
- For a shared CTC channel path, reduce the number of logical partitions in their device candidate lists (PART, PARTITION, or NOTPART keyword on the IODEVICE statement) for the devices assigned to the channel path. The default device candidate list for a device assigned to a shared CTC channel path contains all the LPs in the candidate list of the CTC channel path. Specify a subset of these partitions in the PART, PARTITION, or NOTPART keyword on the IODEVICE statements for each device attaching to the same control unit.
- For a spanned FC channel path, use the same link address in each CSS of a control unit for channel path *xx*.

ICP361I DEVICE NUMBER *xxxx* IN SUBCHANNEL SET *w* ASSIGNED TO CONTROL UNIT *yyyy* IS DUPLICATED IN A LOGICAL PARTITION IN CSS *z*

Explanation: Device number *xxxx* in subchannel set *w* assigned to control unit *yyyy* was defined more than once in a logical partition in CSS *z*. A logical partition cannot access more than one device in a subchannel set with the same device number.

IOCP determines if a logical partition can access a device by testing the access lists of the *chpids* assigned to the devices along with the device candidate lists (PART, PARTITION, or NOTPART keyword in the IODEVICE statement). The duplicate device number error occurs if an access list of a *chpid* assigned to each device includes the same logical partition and the device candidate lists of each device include the same logical partition and the devices are in the same subchannel set.

System Action: IOCP does not complete the generation of an IOCDS and does not produce configuration reports.

Programmer Response: Ensure that device numbers in a subchannel set are not duplicated within a logical partition. Logical partitions must use unique device numbers in a subchannel set.

Do one of the following:

- Change the device number so that it is not duplicated
- Modify the initial access lists of the *chpids* assigned to the two devices so that they do not specify the same logical partition
- Modify the device candidate lists so that they do not specify the same logical partition

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ICP362I TOO MANY DEVICES ASSIGNED TO CONTROL UNIT *xxxx*

Explanation: You specified too many devices for control unit *xxxx*. You can define a maximum of 256 devices for a control unit.

System Action: IOCP does not complete the generation of an IOCDS and does not produce configuration reports.

Programmer Response: Reduce the number of devices attaching to control unit *xxxx*.

ICP363I CONTROL UNIT HEADER SPECIFICATION ERROR FOUND WHILE PROCESSING CONTROL UNIT *nnnn* **IN CSS** *x*

Explanation: IOCP found a specification error while building a control unit header (CUH). A CUH can have a maximum of eight paths in it. The CUH in CSS *x* containing control unit *nnnn* exceeds this maximum.

System Action: IOCP does not complete the generation of an IOCDS and does not produce configuration reports.

Programmer Response: Either reduce the number of channel paths attaching to physical control units in the CUH or reduce the number of physical control units in the CUH by changing the way devices are shared between the control units.

ICP364I CHPID *xx* **IN CSS** *w* **CONNECTS TO CHPID** *yy* **IN CSS** *z* **BUT CHPID** *yy* **IN CSS** *z* **HAS NOT BEEN DEFINED OR IS NOT TYPE=ICP**

Explanation: You specified channel path *yy* in CSS *z* in the CPATH parameter on the CHPID statement for ICP channel path *xx* in CSS *w*. Channel path *yy* in CSS *z* must be defined in the I/O configuration as an ICP channel path but is not.

System Action: IOCP does not complete the generation of an IOCDS and does not produce configuration reports.

Programmer Response: Define channel path *yy* in CSS *z* as an ICP channel path (TYPE keyword) or specify a different ICP channel path in the CPATH keyword which is not connected to any other ICP channel path.

ICP365I CHPID *xx* **IN CSS** *m* **IS ALREADY CONNECTED TO CHPID** *yy* **IN CSS** *n* **AND THEREFORE CANNOT CONNECT TO CHPID** *zz* **IN CSS** *w*

Explanation: You specified ICP channel path *xx* in CSS *m* in the CPATH parameter on the CHPID statement for ICP channel path *yy* in CSS *n*. However, channel path *xx* is also in the CPATH parameter on the CHPID statement for ICP channel path *zz* in CSS *w*. An ICP channel path (TYPE keyword) can only connect to one ICP channel path.

System Action: IOCP does not complete the generation of an IOCDS and does not produce configuration reports.

Programmer Response: Specify a different, available ICP channel path in the CPATH keyword for one of the ICP channel paths *yy* or *zz*.

ICP366I CHPIDS *xx* **AND** *yy* **IN CSS** *z* **HAVE INVALID CANDIDATE LISTS**

Explanation: Channel paths *xx* and *yy* in CSS *z* are ICP channel paths (TYPE keyword) and are connected to each other. However, both channel paths have candidate lists with the same, single logical partition (LP) which is not allowed.

System Action: IOCP does not complete the generation of an IOCDS and does not produce configuration reports.

Programmer Response: Specify multiple LPs in at least one of the candidate lists for the channel paths, or specify different LPs in each candidate list.

ICP367I CHPID *xx* IN CSS *y* CONNECTS TO ITSELF

Explanation: You specified ICP channel path *xx* in CSS *y* in the CPATH and PATH parameters on a CHPID statement such that the channel path connects to itself. You must connect an ICP channel path to another ICP channel path and not to itself.

System Action: IOCP does not complete the generation of an IOCDS and does not produce configuration reports.

Programmer Response: Connect ICP channel path *xx* to another ICP channel path.

ICP368I NONE OF THE DEVICES ASSIGNED TO CONTROL UNIT *xxxx* ACCESS CSS *y*

Explanation: You specified a null device candidate list for every device assigned to control unit *xxxx* such that no device accesses CSS *y* of the control unit. If a control unit has devices, every CSS for the control unit must have at least one device that can access it.

System Action: IOCP does not complete the generation of an IOCDS and does not produce configuration reports.

Programmer Response: Either remove CSS *y* from the PATH keyword for the control unit or modify the device candidate lists so that at least one device can access CSS *y* on the control unit.

ICP400I READ/WRITE OF IOCDS IS INVALID ON THIS PROCESSOR (*xxxx*)

Explanation: An option to print a report from an IOCDS or to write an IOCDS to the support element (SE) hard disk has been specified. However, running ICPIOCP (z/OS or VSE) or specifying ICP for the IOCP command program option (VM) only reads or writes an IOCDS for those CPCs that require the ICP version of IOCP. The CPC has a machine type of *xxxx*. See Table F-3 on page F-5 to determine which CPCs ICP IOCP supports.

System Action: IOCP sends message ICP051I and ends.

Programmer Response: If you are verifying an input file that was written for those CPCs that require the ICP version of IOCP, perform one of the following and run the job again:

- For z/OS and VSE, omit the WRTCDS and REPORT options in the PARM parameters of the EXEC statements.
- For VM, enter the ICP program option and omit the configuration report and write IOCDS options in the IOCP command.
- If you want to read or write an IOCDS, you must use the IOCP required by your CPC.

Note: If your CPC supports ICP IOCP, you might not have the correct IOCP level for your CPC. You must use an IOCP release level that supports your CPC. To help you determine the minimum level of IOCP required for your CPC, see “Summary of Changes” on page xvii.

Problem Determination: Related message ICP051I indicates the function IOCP attempted.

ICP401I READ/WRITE IOCDS FACILITY TEMPORARILY BUSY (RC=*x*). RETRY LATER

Explanation: IOCP attempted to read or write an IOCDS. However, the facility which reads and writes IOCDSs is temporarily busy. Return code 4 indicates that the support element is temporarily busy and could not process your read/write IOCDS request. Return code 8 indicates that the operating system facility that handles read/write IOCDS requests is busy with another request and could not process your request.

System Action: IOCP sends message ICP051I and ends.

Programmer Response: Wait a few minutes and rerun the IOCP. If the problem occurs again, notify the system programmer.

Problem Determination: Related message ICP051I indicates the function IOCP attempted.

ICP402I IOCP RECEIVED AN UNEXPECTED RESPONSE CODE OF *xxxx* HEX ATTEMPTING READ OR WRITE OF AN IOCDS

Explanation: IOCP attempted to read or write an IOCDS and received an unexpected response code. You may have received one of the following response codes:

- Response codes 0040 and 05F0 indicate that the read/write IOCDS facility of the support element is currently unavailable
- Response code 04F0 indicates that two users are attempting to write an IOCDS at the same time. Only one job fails. The IOCDS written is associated with the successful job.

System Action: IOCP ends the read or write operation.

Programmer Response: For response codes 0040 and 05F0, reboot the support element, and then rerun the failing job. Otherwise, wait a few minutes and rerun the failing job. If the problem occurs again, notify your service representative.

Problem Determination: If you are running IOCP on VM or as a guest on VM, see "IOCP Command Usage Notes for VM" on page 4-9 for possible reasons for unexpected response codes.

ICP403I LEVEL A*x* IOCDS IS INVALID

Explanation: IOCP received a response from the SERVICE CALL SVC (SVC 122) where the return code field in the SERVICE CALL data block is 6A (hex). This indicates that IOCP is attempting to read an IOCDS that either is being updated or was not closed after the last time data was written to it. The IOCDS is not considered valid.

System Action: IOCP ends the read operation.

Programmer Response: Rerun the job. If the problem occurs again, re-write the IOCDS.

ICP404I LEVEL A*x* IOCDS HAS INVALID FORMAT OR DIRECTORY

Explanation: IOCP has read an IOCDS into storage from the support element (SE) hard disk and compared the member names and sector sizes in the directory record and the IOCDS format against the expected values. Either the IOCDS format or directory does not match the expected values.

This occurs when the ICP IOCP tries to read an IOCDS that was written by a version of IOCP other than ICP (for example, IYPIOCP for z/OS and VSE and program option IYP for VM).

System Action: IOCP ends the read operation.

Programmer Response: Ensure that you have run the correct version of IOCP. Rerun the job. If the problem occurs again, notify the system programmer.

ICP405I IOCP RECEIVED AN UNEXPECTED RETURN CODE OF *xxxx* HEX ATTEMPTING READ OR WRITE OF AN IOCDS

Explanation: IOCP attempted to read or write an IOCDS and received an unexpected return code.

System Action: IOCP ends the read or write operation.

Programmer Response:

Code	Description
09, 65	Either return code indicates that two users are attempting to read or write an IOCDS at the same time. Wait a few minutes and rerun the job. **Note:** If two jobs are attempting to write the same IOCDS, only one will fail, but the IOCDS that is written may be unusable.
50	You attempted to write an IOCDS to a remote CPC that is not defined to a Hardware Management Console with LIC Changes enabled. Restart HCD and attempt the IOCDS build again.
51	You attempted to write an IOCDS to a remote CPC, and it did not respond. Ensure that the support element for the CPC is powered on and rerun the job.

66 You attempted to read from an IOCDS or write to an IOCDS that is incorrect for your CPC. Specify a valid IOCDS and rerun the job.

67 You attempted to write one or more write-protected IOCDSs. Remove the write protection and rerun the job.

68 You attempted to write an IOCDS that the CPC does not support (that is, writing an IOCDS with ICP IOCP to a CPC that does not support ICP). If you attempted to write an IOCDS to a 2064 CPC in preparation for upgrading it, see "Machine Rules" on page F-2 to determine which 2064 CPCs allow writing an IOCDS with ICP IOCP.

6A You attempted to read from an IOCDS made incorrect by a write. If a write is currently in progress, wait until the write has completed and rerun the job. If a write is not in progress, you must rewrite the IOCDS prior to reading it.

80 You attempted to read an IOCDS that was never created. Specify an existing IOCDS and rerun the job.

82 You attempted to read an IOCDS from or write an IOCDS to the support element hard disk that is on the other side of a physically partitioned multiprocessor; or you attempted to read an IOCDS from or write an IOCDS to the support element hard disk for a nonexistent side of a non-multiprocessor.

83, 84 Another logical partition has a read or write in progress. Wait a few minutes and then rerun the job.

85 You are reading an IOCDS made incorrect by a previous partition reset while an IOCP write operation was in progress. You must rewrite the IOCDS.

86 You attempted to read or write an IOCDS from an unauthorized logical partition. You can read or write an IOCDS only from an authorized logical partition. Use the Change Logical Partition Security panel to authorize an LP. For more information, see "Related Documents" on page xx for the appropriate operations guide.

Other return codes: If the return code is other than 09, 50, 51, 65, 66, 67, 68, 6A 80, 82, 83, 84, 85, or 86, notify your service representative.

Users of z/OS, VM, or VSE can refer to message ICP051I for more information on which IOCDS caused the problem.

ICP406I READ/WRITE IOCDS REQUEST FAILED WITH ERROR CODE *xxxx* HEX

Explanation: IOCP attempted to read or write an IOCDS. However, the facility which reads and writes IOCDSs is unavailable and failed with error code *xxxx* hexadecimal.

System Action: IOCP sends message ICP0501I and terminates.

Programmer Response: For VSE, ensure that VSE is not running as a guest under VM. VSE does not support reading or writing an IOCDS as a guest under VM. Use the VM version of the IOCP.

If VSE is not running as a guest under VM, report the error code to your service representative.

For z/OS and VM, the read/write IOCDS facility of the CPC is not operational. Report the problem to your service representative.

For VM, if the service representative does not find any problems with the CPC, the problem may exist with the CMS-IOCP interface module (DMSICP).

Problem Determination: Related message ICP051I indicates the function IOCP attempted.

ICP407I TARGET PROCESSOR *xxxx-yyy* DOES NOT MATCH REQUESTED PROCESSOR

Explanation: The Hardware Configuration Definition (HCD) requested that IOCP write an IOCDS to a target CPC at a specific SNA address. Machine type *xxxx* and model number *yyy* are associated with the target CPC on which IOCP attempted to write the IOCDS. The machine type and model number of the target CPC are not compatible with the machine type and model number of the CPC you requested in HCD. One of the following conditions exist:

- You defined the CPC in HCD with the wrong machine type or model number.
- The SNA address defined for the CPC in HCD is incorrect.

System Action: IOCP ends the write operation. The target IOCDS is incorrect and unusable.

Programmer Response: Return to HCD and do one of the following:

- Change the machine type and model number for the CPC to the correct values.

- Correct the SNA address for the requested CPC.

Attempt to build the IOCDS again.

Problem Determination: Related message ICP051I indicates the function IOCP performed. The ID statement at the beginning of the IOCP output listing contains information about the requested CPC.

ICP408I IOCDS A*x* IS WRITE PROTECTED

Explanation: IOCP attempted to write an IOCDS to the support element hard disk but the IOCDS is write-protected.

System Action: IOCP ends the write operation.

Programmer Response: Remove the write protection and rerun the job. To remove the write protection, use **Disable Write Protection** under **Options** on the Input/Output Configuration panel.

ICP409I WRITE OF IOCDS IS INVALID BECAUSE IOCP CANNOT DETERMINE PROCESSOR MODEL NUMBER (RC=*xx*)

Explanation: IOCP is unable to write the IOCDS because it cannot determine the model number of the CPC. Your operating system may be missing maintenance that IOCP requires. IOCP uses the STSI machine instruction or operating system services to determine the CPC model number.

System Action: IOCP sends message ICP051I and ends.

Programmer Response: Notify the service representative.

ICP410I IOCP WAS UNABLE TO OBTAIN SUFFICIENT STORAGE TO REPORT ON SYSTEM=(*xxxx,n*) IOCDS A*y*

Explanation: IOCP could not obtain enough storage by using the GETMAIN statement (for z/OS and VM) or the GETVIS statement (for VSE) to report on IOCDS A*y* associated with SYSTEM=(*xxxx,n*). The SYSTEM parameter associated with the IOCDS may be different from the one associated with your CPC. IOCP uses a variable amount of storage based on the type of IOCDS it is processing (that is, the SYSTEM parameter). To determine the specific IOCP storage requirements for your CPC, see Table F-3 on page F-5.

System Action: IOCP ends the read operation for the IOCDS. If you are reporting on multiple IOCDSs, IOCP continues with the next IOCDS.

Programmer Response: Increase the amount of storage available for IOCP use.

For z/OS users, see “IOCP Storage Requirements” on page 3-3.

For VM users, define more virtual storage, perform an IPL of CMS, and send the IOCP command again. For more information, see “IOCP Storage Requirements” on page 4-3.

For VSE users, increase the size of your partition and specify SIZE=AUTO on the EXEC statement of the job to allow IOCP to use the remaining partition size for GETVIS. For more information, see “IOCP Storage Requirements” on page 5-2.

ICP500A PROCESSING COMPLETED. CHECK PRINTER FOR LISTING OR RETURN TO EDITOR.

Explanation: IOCP has processed the data entered on the display frame, completed the requested function, and detected no errors. An output list was produced.

System Action: IOCP waits for an operator response.

Operator Response: Enter a command.

ICP501A PROCESSING COMPLETED. NO PRINTER SPECIFIED-NO LISTING. PROCEED.

Explanation: IOCP has completed the requested function, and detected no errors. An output list was not produced.

System Action: IOCP waits for an operator response.

Operator Response: Enter a command.

ICP502A PROCESSING COMPLETED BUT HAS MESSAGES. RETURN TO EDITOR.

Explanation: IOCP has processed the data entered on the display frame, completed the requested function, and detected a warning or caution message (no errors).

System Action: IOCP waits for an operator response.

Operator Response: Return to the editor to inspect the warning or caution messages and make any necessary changes.

ICP503A PROCESSING COMPLETED. PROCEED.

Explanation: IOCP has processed the data entered on the display frame, completed the requested function, and detected no errors.

System Action: IOCP waits for an operator response.

Operator Response: Enter a command.

ICP504A IOCS IS TOO LARGE FOR IOCP TO READ

| **Explanation:** The card-image file on the support element hard disk contains too many records for IOCP to read.
| IOCP can read a maximum of 256020 cards. Twenty records are reserved for IOCP messages.

| **System Action:** IOCP waits for an operator response.

Operator Response: You can reduce the size of the card-image file by doing one or more of the following:

- Remove comment cards from the card-image file
- Consolidate IOCP statements that are continued across multiple cards onto a minimum number of cards
- Combine individual IODEVICE statements that attach to the same control unit(s) by using common UNIT and MODEL keyword values. Do not combine IODEVICE statements if they have conflicting keyword values.

| If the card-image file size cannot be sufficiently reduced, contact your service representative or perform the IOCP
| function from z/OS, VM, or VSE if possible.

ICP505A IOCS IS TOO LARGE FOR IOCP TO WRITE

| **Explanation:** The card-image file that IOCP read from the support element hard disk or disassembled from an
| IOCDS contains too many records for IOCP to write to the support element hard disk. The maximum size of a
| card-image file is 256020 cards and twenty records are reserved for IOCP messages.

| **System Action:** IOCP waits for an operator response.

| **Operator Response:** For IOCP function **Build data set**, you can reduce the size of the card-image file by doing one
| or more of the following:

- Remove comment cards from the IOCS.
- Consolidate IOCP statements that are continued across multiple cards onto a minimum number of cards.
- Combine individual IODEVICE statements that attach to the same control unit(s) by using common UNIT and MODEL keyword values. Do not combine IODEVICE statements if they have conflicting keyword values.

| If the card-image file size cannot be sufficiently reduced, contact your service representative or perform the IOCP
| function from z/OS, VM, or VSE if possible.

For IOCP function **Disassemble data set**, contact your service representative.

ICP506A CARD INPUT ERROR(S) FOUND, RETURN TO EDITOR

Explanation: IOCP has been requested to **Build** an IOCDS. However, IOCP has detected that the card-image file contains one or more errors.

System Action: IOCP waits for an operator response.

Operator Response: Return to the editor to inspect the error messages, correct the errors, and try again.

ICP507A IOCDS GENERATION ERROR, RETURN TO EDITOR

Explanation: IOCP has been requested to Build an IOCDS. However, IOCP has detected an error while trying to generate an IOCDS.

System Action: IOCP waits for an operator response.

Operator Response: Return to the editor to inspect the error message, correct the error, and try again.

ICP508A CARD IMAGE FILE EXCEEDS ALLOCATED STORAGE

Explanation: IOCP has been requested to Build or Disassemble an IOCDS. However, IOCP does not contain enough storage for the card-image file.

System Action: IOCP waits for an operator response.

Operator Response: Select a logical partition with more storage allocated and perform the function again.

ICP509I ENTRIES BEING PROCESSED. PLEASE WAIT FOR COMPLETION.

Explanation: This message indicates that IOCP is processing the entries for the requested function.

System Action: IOCP locks the keyboard until the function is complete.

Operator Response: Wait for and respond to the next message.

ICP510I ENTRIES BEING PROCESSED. LISTING WILL BE PRINTED.

Explanation: IOCP is processing the requested function and the function includes producing an output list.

System Action: IOCP locks the keyboard until the function is complete.

Operator Response: Wait for and respond to the next message.

ICP511I ENTRIES BEING PROCESSED. PRINTER NOT SPECIFIED.

Explanation: IOCP is processing the entries for the requested function, and, because a printer was not specified, the function does not include an output list.

System Action: IOCP locks the keyboard until the function is complete.

Operator Response: Wait for and respond to the next message.

ICP512A LOGICAL PARTITION HAS INSUFFICIENT STORAGE

Explanation: You selected a logical partition with insufficient storage to perform the selected IOCP function.

System Action: IOCP waits for an operator response.

Operator Response: Select a logical partition with more storage allocated and perform the function again. The Support Element should enforce the correct minimum storage requirement for stand-alone IOCP. Contact your service representative.

ICP515W IOCP TERMINATED. WAIT STATE CODE = B2*x*

Explanation: IOCP has loaded the PSW with a wait state code of B20 through B24. See “IOCP Wait State Codes” on page 6-12 for an explanation of the wait state codes. Also, for more information, see “Related Documents” on page xx for the appropriate stand-alone IOCP document.

System Action: IOCP ends.

Operator Response: See “IOCP Wait State Codes” on page 6-12.

Problem Determination: See “IOCP Wait State Codes” on page 6-12.

ICP550A *dddd*, **INT REQ, CC=3/NO PATH AVAILABLE**

Explanation: Before reading from an input device or writing to an output device, IOCP received a not-operational condition code (code 3) on the path specified. In the message, *dddd* indicates the device address or number.

System Action: IOCP waits for the operator to:

1. Correct the entry or make the path available.
2. Retry the operation.

Operator Response:

1. If the entry for the device was incorrectly specified on the frame, correct the entry and try the operation again.
2. If the path is not available, turn on the path to the device (such as setting the channel or control unit switch) and try the operation again.
3. If the path cannot be made available, run IOCP again using another device or path.

ICP551A *dddd*,**INT REQ**,*cm*,*stat*,*sense*

Explanation: Before reading from an input device or writing to an output device, IOCP detected a device that requires operator intervention.

In the message text, in hexadecimal, the fields are:

dddd The device address or number.

INT REQ
Intervention required.

cm The operation code of the channel command word (CCW) during whose execution the error occurred. If the channel command word cannot be found, this field appears as **.

stat The status portion of the channel status word (CSW).

sense The sense data can be a maximum of 23 bytes long. The first two sense bytes are for the error condition.

System Action: IOCP waits for the operator either to end IOCP or to try the operation again.

Operator Response: Check the following and try the operation again:

- Make the unit ready. If the unit cannot be made ready, run IOCP again using another device.
- Place paper in the paper supply area.
- Remove paper from the output area.

ICP552A *dddd*,*err*,*cm*,*stat*,*sense*

Explanation: Before reading from an input device or writing to an output device, IOCP detected an I/O error that cannot be corrected. Two consecutive commas or a blank field in the message text indicates that a field could not be determined.

In the message text, the fields are:

dddd The device address or number, in hexadecimal.

err A description of the error based on status and sense information:

BOC Bus-out check.

CCC Channel control check.

CDC Channel data check.

CHC Chaining check.

CMD Command reject.

CPC Channel program check.

DCK Data check.

EQC Equipment check.

ICC Interface control check.

IOE Input/output error (for errors other than those described).

OVR Data overrun.

PRC Channel protection check.

SEN A unit check occurred during a sense operation. (When this condition is present, the sense field does not appear in the message text.)

cm The command code, in hexadecimal, of the channel command word (CCW) being processed when the error occurred. If the channel command word cannot be found, this field appears as **.

stat The status portion, in hexadecimal, of the channel status word (CSW).

sense The sense data can be a maximum of 23 bytes long. The first two sense bytes are for the error condition.

System Action: IOCP waits for the operator either to try the operation again or to end IOCP.

Operator Response: This is likely a user or hardware error. Try another device on another channel.

Possible values of the err field and appropriate responses are as follows:

CMD REJECT
Command reject. Check that device entries on the frame are correct.

BOC Bus-out check.

EQC Equipment check.

ICC Interface control check.

OVR Data overrun.

These are permanent hardware faults. Service representative action is required.

ICP553A *dddd*, **INT REQ, CC=3/NO PATH AVAILABLE**

Explanation: While reading from an input device or writing to an output device, IOCP received a not-operational condition code (code 3) on the path specified. In the message, *dddd* indicates the device address or number.

System Action: IOCP waits for the operator to make the path available and to signal IOCP by pressing Enter.

Operator Response:

1. If the path is not available, turn on the path to the device (such as setting the channel or control unit switch) and try the operation again.
2. If the path cannot be made available, run IOCP again using another path or device.

ICP554A *dddd*,**INT,REQ,***cm*,*stat*,*sense*

Explanation: While reading from an input device or writing to an output device, IOCP detected that the device requires operator intervention.

In the message text, in hexadecimal, the fields are:

dddd The device address or number.

INT REQ
Intervention required.

cm The operation code of the channel command word (CCW) during whose execution the error occurred. If the channel command word cannot be found, this field appears as **.

stat The status portion of the channel status word (CSW).

sense The sense data can be a maximum of 24 bytes long. The first two sense bytes are for the error condition.

System Action: IOCP waits for the operator to press Enter.

Operator Response: Check the following:

- Make the unit ready. If the unit cannot be made ready, run IOCP again using another device.
- Place paper in the paper supply area.
- Remove paper from the output area.

Press Enter.

ICP555A *dddd,err,cm,stat,sense*

Explanation: While reading from an input device or writing to an output device, IOCP detected an error that can be tried again or ignored. Two consecutive commas or a blank field in the message text indicates that the field could not be determined.

In the message text, the fields are:

dddd The device address or number, in hexadecimal.

err A description of the error based on status and sense information:

DCK Data check

EQC Equipment check (card reader)

cm The command code, in hexadecimal, of the channel command word (CCW) being processed when the error occurred. If the channel command word cannot be found, this field appears as **.

stat The status portion, in hexadecimal, of the channel status word (CSW).

sense The sense data can be a maximum of 23 bytes long. The first two sense bytes are for the error condition.

System Action: IOCP waits for the operator to signal IOCP to try the operation again by pressing Enter. If the error occurred on the input device, IOCP tries the read operation again. If the error occurred on the output device, IOCP does not reprint the line.

Operator Response: Have IOCP try the command again (by pressing Enter), or rerun IOCP using another device.

ICP556I *dddd,err,cm,stat,sense*

Explanation: While IOCP was reading from an input device or writing to an output device, IOCP detected an error that cannot be corrected. Two consecutive commas or a blank field indicates that a field could not be determined.

In the message text, the fields are:

dddd The device address or number, in hexadecimal.

err A description of the error based on status and sense information:

BOC Bus-out check.

CCC Channel control check.

CDC Channel data check.

CHC Chaining check.

CMD Command reject.

CPC Channel program check.

EQC Equipment check.

ICC Interface control check.

IOE Input/output error (for errors other than those described).

OVR Data overrun.

PRC Channel protection check.

REC Record error. (The record read was not 80 bytes or a multiple of 80 bytes.)

SEN A unit check occurred during a sense operation. (When this condition is present, the sense field does not appear in the message text.)

cm The command code, in hexadecimal, of the channel command word (CCW) being processed when the error occurred. If the channel command word cannot be found, this field appears as **.

stat The status portion, in hexadecimal, of the channel status word (CSW).

sense The sense data can be a maximum of 24 bytes long. The first two sense bytes are for the error condition.

System Action: IOCP ends by loading a PSW with a wait state code of B23. This is likely a hardware error. (Try another device on another channel.)

For a magnetic tape unit, do not unconditionally accept the results of the operation. Check that the tape being used for this job has not been replaced or removed. Each message should be considered as a potential warning of a marginal condition.

For a card reader, note that some abnormal error condition occurred. Depending on the severity of the error (check the status information and the sense information) and, depending on the site requirements, take the appropriate action.

Possible values of the err field and appropriate responses are as follows:

CMD REJECT
Command reject. Correct the command and try the function again.

BOC Bus-out check.

EQC Equipment check.

ICC Interface control check.

OVR Data overrun.

These are permanent hardware faults. Service representative action is required.

IOCP Messages (DMSICP Prefix)

Only the VM version of IOCP sends the following messages. The messages are arranged in alphanumeric order by message identifier.

The message format is:

`DMSICP`*`nnn`*`E` *`text`*

nnn
Is the message number.

text
Is the message text.

Note: The CMS-IOCP interface module sends these error messages with corresponding return codes (RCs) for each message.

DMSICP001E No filename specified

Explanation: The IOCP command requires you to specify the name of the file containing the source IOCP statements or the name of the file to contain the IOCP output file.

System Action: Processing of the command ends. The system status remains the same. RC=24.

User Response: Issue the command again and specify the file name of the IOCP input or output file.

DMSICP002E File '*filename***' not found**

Explanation: The specified file (file name IOCP) was not found on any accessed disk. Either the file does not reside on any accessed disk or the file name was misspelled.

System Action: Processing of the command ends. The system status remains the same. RC=28.

User Response: Find or create the desired file. To make sure that the file exists, send either one of the following commands:

```
STATE filename IOCP *
```

or

```
LISTFILE filename IOCP *
```

Correct the command and send it again.

DMSICP003E Invalid option: '*option***'**

Explanation: The specified option is incorrect.

- The option may have been misspelled.
- If the option can be truncated, it may have been truncated improperly.
- The option may conflict with another option in the command line.

System Action: Processing of the command is ended. The system status remains the same. RC=24.

User Response: Correct the command and send it again.

DMSICP006E No read/write disk accessed

Explanation: You do not have access to a read/write disk on which the command can write its output file.

System Action: Processing of the command ends. The system status remains the same. RC=36.

User Response: Access a read/write disk and send the command again, or send the CP LINK command to reset the A-disk to read/write mode. Access the A-disk again, and send the command.

DMSICP007E File '*file name***' IOCP is not fixed, 80-character records**

Explanation: The specified file must have fixed-length, 80-character records for the command to be processed.

System Action: Processing of the command ends. The system status remains the same. RC=32.

User Response: It is possible that an incorrect file identification was specified in the command line. In this situation, send the command again. If, however, the file identification was correct but the file has the wrong format or does not contain 80-character records, change the file's format or record length with the COPYFILE or XEDIT command.

DMSICP038E Fileid conflict for DDNAME SYSIN

Explanation: You have sent the IOCP command for a file (file name IOCP) that exists on a disk. Prior to this, you sent a FILEDEF command that does not point to the same file. The CMS-IOCP interface module does not choose between the two valid file definitions and sends this error instead.

System Action: Processing of the command ends. The system status remains the same. RC=40.

User Response: Check that you specified the correct file name with the IOCP command. Then, do one of the following:

- If the file name is correct, send a FILEDEF SYSIN CLEAR command for the file.
- If the file name is not correct, use a different file name on the IOCP command or erase the existing disk file (file name IOCP).

DMSICP070E Invalid parameter '*parameter***'**

Explanation: An incorrect operand was specified in the command line.

System Action: Processing of the command ends. The system status remains the same. RC=24.

User Response: Correct the command line and send the command again.

DMSICP075E Device '*devtyp*' invalid for input

Explanation: The device specified for the input *ddname* (SYSIN) is incorrect. This message appears if the input device specified is DUMMY, PRINTER, PUNCH, TERMINAL, or GRAF ('devtyp' = CRT).

System Action: Processing of the command ends. The system status remains the same. RC=40.

User Response: Issue the FILEDEF command again and specify the correct input device.

DMSICP099E CMS/DOS environment active

Explanation: The IOCP command cannot be processed while the CMS/DOS environment is active.

System Action: Processing of the command ends. The system status remains the same. RC=40.

User Response: Use the SET DOS command to deactivate the CMS/DOS environment. Then send the IOCP command again.

Appendix A. Coding IOCP Statements

This appendix describes the rules for coding IOCP card-image statements and the notation this document uses to describe the statements.

Rules for Coding IOCP Statements

The rules for coding IOCP statements are those of the assembler language. The following paragraphs are a summary of these rules as stated in *High Level Assembler for MVS & VM & VSE Language Reference*, SC26-4940.

IOCP statements have the following standard format:

Name	*Operation*	*Operand*	*Comments*

Name Symbolically identifies the statement. If included, it must contain from 1-8 alphanumeric or special (#, @, or $) characters, the first of which must be alphabetic or special character. Only uppercase characters are allowed. The name must begin in the first column of the statement and must be followed by one or more blanks. IOCP ignores the name field of an IOCP statement.

Operation
Identifies the statement. It must be preceded and followed by one or more blanks. The operation field can start in the second column of the statement if the name field is not used.

Operand
Contains parameters coded in any order and separated by commas. The operand field ends with one or more blanks placed after the last parameter. However, for the ID statement, IOCP does allow a comma to be coded as the last character of the operand field.

Most parameters consist of a keyword followed by an equal sign (=) and the keyword value. The keyword value can be a single value (or subfield) or a list of values (or subfields). If the keyword value consists of more than one subfield, the subfields must be separated by commas and the list of subfields must be enclosed in parentheses.

When a subfield contains multiple values (such as the UNITADD= subfield in the CNTLUNIT statement), these subparameters are positional and must be coded in the order shown. The operand field can contain a maximum of 1024 characters.

Comments
Can be written in an IOCP statement, but they must be separated from the last parameter of the operand field by one or more blanks. You can use an entire card for a comment by placing an asterisk (*) in the first column or a period and asterisk (.*) in columns 1 and 2. A maximum of two continuation cards can be used for comments.

Note: Stand-alone IOCP removes all comments that begin with ***ICP** and ***IYP**. Stand-alone IOCP uses ***ICP** for IOCP messages inserted into the card-image file. By removing all pre-existing ***ICP** comments, stand-alone IOCP ensures that all ***ICP** comments in the card-image file after IOCP processing are only IOCP messages.

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For HCD

HCD may generate comments that begin with ***$HCDC$** and ***HCD**. They have special meaning to HCD; see the *OS/390 Hardware Configuration Definition User's Guide*, SC28-1848, *z/OS Hardware Configuration Definition User's Guide*, SC33-7988, or *z/VM Dynamic I/O Configuration Planning and Administration*, SC24-6044.

IOCP statements are coded in columns 1-71 of each card. You can continue a statement that exceeds 71 columns onto one or more additional cards by placing a non-blank character in column 72 to indicate the continuation. The statement can be interrupted either at column 71 or after any comma that separates parameters. The continued portion must begin in column 16 of the following card.

Comments can appear on continued cards. Columns 73-80 can be used to code identification or sequence characters if you choose. IOCP prints but does not examine columns 73-80.

Note: If you incorrectly continue a statement and only optional parameters appear on the continued portion, IOCP ignores the optional parameters. For all statements except ID, IOCP issues a message following a continuation card that is treated as a comment by IOCP and is ignored. If there are no parameters but a valid comment exists on the continuation card, IOCP still issues the message. Placing the comment on a comment card instead of a statement card removes the message.

For example, if you do not end the last parameter on a card with a comma but end it with a blank and code a non-blank character in column 72, IOCP ignores the information on the continuation card. Also, if you end the last parameter on a card with a comma and code a non-blank character in column 72 but begin the continuation card in column 17 or higher, IOCP ignores the information on the continuation card.

To avoid this, you can code the optional parameters on the first card of the statement. You should also check the I/O configuration reports to ensure that all channel paths, control units, and I/O devices are defined correctly.

Format and Coding Conventions

The conventions in this user's guide that illustrate the format and coding of IOCP statements are:

- Uppercase letters, numbers, and punctuation marks must be coded exactly as shown.

  Exceptions to this convention are brackets [ ], braces { }, and ellipses..., which are never coded.
- Lowercase letters represent variables for which you must substitute information or specific values.
- Items enclosed in braces, { }, represent alternative items. Only one of the items must be coded.
- Items enclosed in brackets, [ ], are optional. They can be omitted. Conversely, the lack of brackets indicates that an item must be coded.
- An ellipsis, ..., indicates that the previous item or group of items can be coded two or more times in succession.

- The ″or″ sign, |, separates alternative items.
- If an alternative item is underlined, it is the default value. IOCP assumes that the default value is your choice if you do not specify the keyword.
- You must enclose single-value subfields in parentheses if you code more than one of them. If you code only one subfield, you can omit the parentheses. For example, you can code either CUNUMBR=(530) or CUNUMBR=530 in the IODEVICE statement.
- You must enclose the UNITADD= subfields in the CNTLUNIT statement in double parentheses because these subfields can contain multiple values. (Single parentheses enclose each subfield; another set encloses all the subfields.) For example, you code UNITADD=((00,16),(20,8)). If you code only a single subparameter for one subfield, you can omit the parentheses. For example, you can code either UNITADD=((0A)) or UNITADD=0A.
- Parameters, subfields, and subparameters coded in the operand field must be separated by commas.

Example

A typical statement might be:

```
CU10A CNTLUNIT CUNUMBR=10A,PATH=06,SHARED=N,                          X
               UNIT=2821,UNITADD=((0A,3))     Plan 3
```

CU10A is the symbolic name of the statement.

CNTLUNIT identifies the statement to the system.

CUNUMBR=10A, PATH=06, and SHARED=N are required parameters, separated by commas, containing keywords and keyword values. Because the statement is continued, a comma follows SHARED=N, and a non-blank character (X) is placed in column 72.

UNIT=2821, and UNITADD=((0A,3)) are also required parameters and start in column 16 of the continued statement. Because UNITADD=((0A,3)) is the last parameter, it is followed by a blank to indicate the end of the operand field.

Plan 3 is a comment.

Appendix B. Lists of Statement Input

Figure B-1 shows a listing of a sample IOCP input file.

```
 ID MSG1='SAMPLE IOCP INPUT'
*
 RESOURCE PARTITION=(CSS(0),LP1,LP2,LP3)
*
 CHPID PCHID=100,PATH=20,TYPE=CVC,PART=(LP1,REC)
 CHPID PCHID=101,PATH=21,TYPE=CNC,SHARED
 CHPID PCHID=102,PATH=22,TYPE=CNC,SHARED
 CHPID PCHID=103,PATH=23,TYPE=CNC,SHARED
 CHPID PCHID=104,PATH=24,TYPE=CNC,SHARED
*
 CNTLUNIT CUNUMBR=000,PATH=(20),PROTOCL=D,SHARED=N,UNIT=3274,          +
               UNITADD=((C0,32))
 IODEVICE ADDRESS=(0C0,32),CUNUMBR=(000),UNIT=3279,MODEL=3B
*
 CNTLUNIT CUNUMBR=010,PATH=(21),UNIT=3990,UNITADD=((00,32))
 CNTLUNIT CUNUMBR=011,PATH=(22),UNIT=3990,UNITADD=((00,32))
 IODEVICE ADDRESS=(100,32),CUNUMBR=(010,011),UNIT=3390
*
 CNTLUNIT CUNUMBR=020,PATH=(23),UNIT=3480,UNITADD=((00,16))
 CNTLUNIT CUNUMBR=021,PATH=(24),UNIT=3480,UNITADD=((00,16))
 IODEVICE ADDRESS=(480,16),CUNUMBR=(020,021),UNIT=3480,UNITADD=00
```

Figure B-1. Sample IOCP Statements

Figure B-2 shows a listing of sample SYSTEM CONFIG statements used for VM I/O definition.

```
/************************************************/
/*   RDEVICE statements                         */
/************************************************/
    Rdevice 100-108    Type 3270_DISPLAY
    Rdevice 181        Type CTCA
    Rdevice 182        Type 3420 Model 4
    Rdevice 190        Type Tape
    Rdevice 3C0-3C7    Type DASD
    Rdevice 9000       Type IMPACT_PRINTER NOTSENSED
```

Figure B-2. Sample SYSTEM CONFIG Statements for VM I/O Definition

Figure B-3 on page B-2 shows a listing of a HCPRIO file used for VM system generation.

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```
FILE: HCPRIO   ASSEMBLE A               SP/CMS REL 2.1 CSL 24       DSD - COMSYS              PAGE 001

 RIO TITLE 'HCPRIO -- SAMPLE'                                        HCP00010
          RDEVICE ADDRESS=001,DEVTYPE=3211,CLASS=(A),FEATURE=UNVCHSET HCP00020
          RDEVICE ADDRESS=012,DEVTYPE=3505                           HCP00030
          RDEVICE ADDRESS=013,DEVTYPE=3525,CLASS=C                   HCP00040
          RDEVICE ADDRESS=(020,16),DEVTYPE=3279,MODEL=3              HCP00050
          RDEVICE ADDRESS=090,DEVTYPE=3705,ADAPTER=BSCA,BASEADD=0F0  HCP00060
          RDEVICE ADDRESS=0F0,DEVTYPE=3705,ADAPTER=TYPE1,MODEL=F8    HCP00070
          RDEVICE ADDRESS=0F1,DEVTYPE=3705,ADAPTER=TYPE4,MODEL=F8    HCP00080
          RDEVICE ADDRESS=(140,8),DEVTYPE=3350,CUTYPE=3880-11        HCP00090
          RDEVICE ADDRESS=(168,8),DEVTYPE=3350                       HCP00100
          RDEVICE ADDRESS=(3B0,8),DEVTYPE=3380                       HCP00110
          RDEVICE ADDRESS=(3C0,8),DEVTYPE=3380                       HCP00120
          RDEVICE ADDRESS=(3D0,8),DEVTYPE=3380                       HCP00130
          RDEVICE ADDRESS=(11A0,16),DEVTYPE=3380                     HCP00140
          RIOGEN CONS=020,ALTCONS=021                                    HCP00150
          END                                                        HCP00160
```

Figure B-3. HCPRIO File for VM System Generation

Figure B-4 shows the VSE system generation input that corresponds to the IOCP statements in Figure B-1 on page B-1.

Note: See Chapter 7, “IOCP Configuration Reports,” on page 7-1 for examples of the reports IOCP produces.

```
ADD 0C0:0DF,3279
ADD 100:11F,3390
ADD 480:48F,3480
```

Figure B-4. Source Input for VSE System Generation

Appendix C. Characteristics of the I/O Interface Timeout Function

In the CPC, each channel path has I/O interface timeout functions that time the control unit delays in completing the following I/O interface sequences:

- A 4-second timeout for all selection and status presentation sequences. A timeout occurs if the sequence is not complete within 4 seconds.
- A 30-second timeout for data transfer. A timeout occurs if a byte of data is not transferred within 30 seconds.

If a timeout occurs, the channel terminates the I/O request to the control unit and generates an interface-control-check interruption.

For additional information about these sequences, see *System/360 and System/370 I/O Interface Channel to Control Unit Original Equipment Manufacturers' Information*, GA22-6974.

Malfunctions in control units and I/O devices can cause a channel path to be unavailable to other control units and I/O devices. The timeout function detects these malfunctions.

When the timeout function is inactive (timeout is inhibited), control unit delays are not timed and the channel unconditionally waits until the control unit completes the sequence or initiates the next tag sequence. If the control unit fails to complete a sequence because of a malfunction, the channel path remains active to the control unit. In this situation, the channel path is unavailable for I/O requests to other control units until the failing control unit deactivates all in-tags (except metering-in and request-in) or until the channel path is reset.

The channel times I/O requests as follows:

- If TIMEOUT=Y is specified, the I/O interface timeout function is active and the channel times all I/O tag sequences and delays between dependent tag sequences that are initiated by either the channel or the control unit. Some examples are:
  - The initial selection sequence resulting from a Start I/O instruction or a Start I/O Fast Release instruction
  - A request-in tag sequence initiated by the control unit to reconnect to the I/O interface
  - Delays between data transfer tag sequences
- If TIMEOUT=N is specified, the I/O interface timeout function is inactive (timeout is inhibited) for:
  - Data transfer tag sequence
  - Delays between data transfer tag sequences

Timeout is inhibited from the rise of service-out that follows status-in during the initial selection sequence until the rise of service-out that follows status-in during the ending sequence.

Examples follow that show when the timeout function is inactive if TIMEOUT=N is specified.

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Example A. Channel initiated sequence (for example, SIO)

```
Initial          Data                Ending status:
selection        transfer            channel end and
sequence         sequences           device end sequence

<---Timed-----><---Not timed-----><--------Timed------------>
```

Example B. Command chaining control unit initiated reconnection sequence

```
Device end   Initial        Data              Ending status:
reconnect    selection      transfer          channel end and
sequence     sequence       sequences         device end sequence

<--------Timed------------><--Not timed--><---------Timed----------->
```

When a timeout condition is detected, the channel terminates the I/O request to the control unit by issuing a selective reset to the control unit and then generating an interface-control-check interruption. A channel report word (CRW) is made pending, which indicates a channel-path-terminal condition.

If TIMEOUT=N is specified, detection of a timeout condition as a result of an interface associated malfunction may not occur (see the beginning of this appendix for a description of sequences that are not timed when TIMEOUT=N is specified). Failure to detect and recover this condition may make various resources unavailable to the control program. If continued operation is dependent on the availability of these resources, system degradation may be experienced until those resources are recovered. Recovery may occur as a consequence of detecting a secondary error the CPC may develop from failing to detect the timeout condition. Generally, this does not occur and recovery of the resources requires operator intervention. For these reasons TIMEOUT=N should be coded only when you decide a real need exists that justifies the exposure.

Timeout Considerations

Some control units and I/O devices have valid operational conditions that exceed the 30-second I/O interface timeout function limit. If timeout is active when such a condition occurs, the channel terminates the I/O request and generates an interface-control-check interruption, even though no malfunction exists. For example:

- A timeout might occur during a read operation to a magnetic tape unit if the tape being read is blank. While the magnetic tape unit searches for a data byte or the end-of-tape mark, it might exceed the 30-second timeout function limit.
- A channel-to-channel adapter between two CPCs might time out if one system attempts to communicate with the other system while the other CPC is in a stopped state.

When timeout is active, the channel might terminate an I/O request and generate an interface-control-check interruption even though no control unit or I/O device malfunction has occurred.

Note: For a device with valid operational conditions that can exceed the 30-second I/O interface timeout limit, you should inhibit the timeout function by specifying TIMEOUT=N in the IODEVICE statement. For other IBM I/O devices, it is recommended that you specify the default TIMEOUT=Y.

Appendix D. List of I/O Devices and Control Units

Appendix D Usage Notes

The list is not intended to completely describe every available control unit and device supported by those processors that support the IOCP described by this user's guide.

This document does not attempt to define all device requirements. It is meant to be a general reference guide for configuring nonspecific I/O devices. For information concerning the configuration of specific I/O devices, please consult the device planning manuals associated with those devices. They contain the most current, accurate information concerning device configuration. Appendix D provides some information for some specific I/O devices, but it should by no means be considered the primary or the complete source for such information.

For the CPC, the tables in this chapter provide a list of I/O devices and show the keyword values you specify for the UNIT, MODEL, and STADET keywords in the IODEVICE statement. Also, they list the control units that attach to the I/O devices and show the keyword values you specify for the UNIT, SHARED, and PROTOCL keywords in the CNTLUNIT statement. Notes, which are referred to in the list of devices and control units, contain additional information for specific I/O devices and control units.

See "Specifying IOCP Statements" on page 2-2 for a full description of the IODEVICE and CNTLUNIT statements and the meanings of the keyword values shown in the tables in this chapter.

The following items are presented for your review of I/O devices and control units:

1. Devices that IOCP supports are not necessarily supported by your operating system.
2. Devices that your operating system supports are not necessarily supported by IOCP for those processors that support the IOCP described by this user's guide.
3. If you use the UNITADD keyword in the IODEVICE statement, you must follow the same rules and restrictions that apply to the last two digits of the ADDRESS parameter.
4. If you specify the UNITADD parameter in the IODEVICE statement, the last two digits of the ADDRESS parameter can be different from the device's physical unit address if you follow these rules:
   - All device rules for addressing must be followed.
   - For tape units and display devices, all unit addresses on a control unit must be consecutive and the lowest unit address must be modulo[1] to the number of devices that can be attached to the control unit.
   - The lowest unit address on a string of DASDs must be modulo to the maximum string size.

1. Modulo means that the unit address must be evenly divisible by the number of devices in hexadecimal. For example, for 16 devices, the last digit of the unit address must be 0. For four devices, the last digit must be 0, 4, 8, or C.

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Table D-1. IOCP Parameter Values for IODEVICE and CNTLUNIT Statements

IODEVICE Statement				**CNTLUNIT Statement**				
UNIT=	**MODEL=**	**STADET=**	**Notes**	**UNIT=**	**Model**	**SHARED=**	**PROTOCL=**	**Notes**
Direct Access Storage Devices								
3330	1, 2, 11	Y	1	3880	1, 2, 11	N	D or S	2, 3
3330V		Y	4	3830	3	N	D	4
3333	1, 11	Y		3880	1,2,11	N	D or S	2, 3
3350		Y	1,5	3830	3	N	D	
				3880	1,2,11	N	D or S	2, 3
3350P		Y	1,5	3880	11	N	D or S	2, 3, 6
3351P		Y	1, 7	3880	21	N	D or S	2, 3, 8
3375		Y		3880	1, 2	N	D or S	2, 3
3380		Y		3880	2, 3	N	D or S	2, 3
				3880	13	N	S	2
				3880	21,23	N	S or S4	2
				3990	1	N	S	2, 3
				3990	2	N	S or S4	2, 28
				3990	3	N	S4	2, 28
			49	2105	All			28, 50
3390		Y	24	3990	2, 3, 6	N	S4	2, 28
			49	2105	All			28, 50
3851		Y		3851	All	N	D	
9345		Y		9341		N	S or S4	31
				9343	All	N	S or S4	30, 31
Display Devices								
3178		Y		3174, 3274		N or Y	D	11, 36
3179		Y		3174, 3274		N or Y	D	11, 36
3180		Y		3174, 3274		N or Y	D	11, 36
3251		Y		3258		Y	D	
(by 3255)				5088		N	D or S	12
3270	X		29, 42	OSC				
3270 PC		Y		3174, 3274		N or Y	D	11, 36
3277		Y		3272		N or Y	D	11
				3174, 3274		N or Y	D	11, 36
3278				3174, 3274		N or Y	D	11, 36
3279				3174, 3274		N or Y	D	11, 36
3290				3174, 3274		N or Y	D	11, 36
5081 (by 5085)		Y	9	5088		N	D or S	12
6580 (with 3270 feature)		Y		3174, 3274		N or Y	D	11, 36

Table D-1. IOCP Parameter Values for IODEVICE and CNTLUNIT Statements (continued)

IODEVICE Statement				**CNTLUNIT Statement**				
UNIT=	**MODEL=**	**STADET=**	**Notes**	**UNIT=**	**Model**	**SHARED=**	**PROTOCL=**	**Notes**
PC (with 3277 feature)		Y		3174, 3274		N or Y	D	11, 36
Printers								
1403	N1, 2, 7	Y		2821	1, 2, 3, 5	N	D	
3170		Y		3170		N	D, S, or S4	
3203	5	Y	17	3203	4	N	D	
3211	1	Y	18	3811	1	N	D	
3230	2	Y		3174, 3274		N or Y	D	11
3262	3, 13	Y		3272		N or Y	D	10
				3174, 3274		N or Y	D	11
3262	5	Y		3262		N	D	
3268	2	Y		3174, 3274		N or Y	D	11
3286		Y		3272		N or Y	D	10
				3174, 3274		N or Y	D	11
3287		Y		3272		N or Y	D	10
				3174, 3274		N or Y	D	11
3289	2	Y		3272		N or Y	D	10
		Y		3174, 3274		N or Y	D	11
3800	1, 3	Y	13, 14	3800		N	D or S	12
3820		N		3820		N	D	
3900		Y		3900		N	D, S, or S4	
4100		Y		4100		N	D, S, or S4	
4245		Y		4245		N	D	
4248		Y		4248		N	D	
4250		Y		3174, 3274		N or Y	D	11
7374 (by 5085)		Y		5088		N	D or S	12
7375 (by 5085)		Y		5088		N	D or S	12
Magnetic Tape Units								
3420	3, 4, 5, 6, 7, 8	Y	15	3803	1, 2	Y	D	15
3422		Y		3422		Y	D or S	
3480		Y		3480		N	D, S, or S4	25
3490		Y	39, 41, 46	3490	A0x, B0x, D3x	N	D, S, or S4	25, 28, 38
3490E		Y	40, 41, 46	3490E	Ax0, Bx0, Cxx, D4x	N	D, S, or S4	25, 28, 38
3590		Y	45, 46	3590				28, 43
			40, 45, 46	3591				28, 43

Table D-1. IOCP Parameter Values for IODEVICE and CNTLUNIT Statements (continued)

IODEVICE Statement				**CNTLUNIT Statement**				
UNIT=	**MODEL=**	**STADET=**	**Notes**	**UNIT=**	**Model**	**SHARED=**	**PROTOCL=**	**Notes**
Card Readers and Punches								
2501	B1, B2	Y		2501	B1, B2	N	D	
2540	1	Y	16	2821	1, 5, 6	N	D	
3505		Y		3505	B1, B2	N	D	
3525		Y		3505	B1, B2	N	D	
Data Transmission Multiplexers								
uuuuu		N	20	2701	1	N	D	
3704		N	18	3704	All	N	D	
uuuuu		N	21	3704	All	N	D	
3705		N	18	3705	All	N	D	
(3274A)			18					
uuuuu		N	21	3705	All	N	D	
Communication Controllers								
3725		N	18	3725		N	D	
uuuu		N	21	3725		N	D	
3745		N	18	3745		N	D or S	
			29, 42	OSN				
uuuu		N	21	3745		N	D or S	
3746		N	44	3746		N	D or S	
uuuu		N	44	3746		N	D or S	
3791L		N	18	3791L		N	D	
3791L, 3174		Y		RS6K, 3791L, 3174		N	D, S or S4	
(3174 SNA parallel channel)		N	18	3791L		N	D or S	
(3174 Token Ring Gateway)		N	18, 37	3791L		Y	D or S	
(3174 ISDN Gateway)		N	18, 37	3791L		Y	D or S	
(3274A)		N	18	3791L		N	D	
Series/1*								
uuuu		Y	33	uuuu		N	D	33
Other								
CTC		Y	19, 22	CTC		N	D	
				3088	1,2	N	D, S, or S4	23

Table D-1. IOCP Parameter Values for IODEVICE and CNTLUNIT Statements (continued)

IODEVICE Statement				CNTLUNIT Statement				
UNIT=	**MODEL=**	**STADET=**	**Notes**	**UNIT=**	**Model**	**SHARED=**	**PROTOCL=**	**Notes**
3172, CTC, 3088		Y		3172		N	D, S, or S4	47
RS6K, CTC, 3088		Y		RS6K, CTC, 3088		N	D, S, or S4	
3995		Y		3995		N	D, S, or S4	28, 32
SCTC		Y	34	SCTC				
BCTC		Y	35	SCTC				
FCTC		Y	34	FCTC				
3848		Y		3848	1	N	D or S	
CFS				CFS				
OSA			29, 42	OSA				
OSAD				OSA, OSN				
OSN			29, 42	OSN				
ESCON Directors								
SWCH		Y	26	9032	All			27, 28, 48
				9033				27, 28, 48
				SWCH				27, 28, 48
FICON Directors								
SWCH		Y	26	2032				27, 28
				2042				27, 28
				SWCH				27, 28

z/OS Considerations

Several of the following notes only apply to HCD when migrating IOCP input (see Notes 16, 17, 18, 20, 21, 24, 33, 39, 40, and 49).

Notes:

1. IOCP generates only the specified number of devices. IOCP does not generate any extra devices based on the device type. You must specify all the devices that exist for the given device type.
2. For the 3880, one CNTLUNIT statement must be specified for each Storage Director in the 3880. For the 3990, one CNTLUNIT statement must be specified for each multipath storage director in the 3990.
3. Each channel path attaching to the 3880 Model 1, 2, 3, or 11 can operate independently in either data-streaming mode or offset interlock mode. The 3880 has eight channel speed control switches for setting the mode of operation. Regardless of the device types attached to the 3880, it is recommended that the user: (a) set all 3880 channel speed control switches for channel paths attached to the CPC to data-streaming mode; (b) specify

PROTOCL=S in the CNTLUNIT statements for each 3880 Storage Director. These actions allow the maximum data transfer rates and the use of longer cable lengths.

The CPC requires all control units that attach a common device to the CPC to use the same interface protocol. Therefore, when both a 3880 and a 3830 attach a common device to the CPC, the user must specify PROTOCL=D on both the CNTLUNIT statement for the 3830 storage director and the CNTLUNIT statements for the attached 3880 Storage Directors. In this situation, you must set the 3880 channel speed control switches for the channel paths that attach the 3880 Storage Directors to the non-data-streaming mode.

4. For the 3330V (virtual volumes for the MSS using 3350 devices as staging drives), you must also specify the 3851 in an IODEVICE statement and an associated CNTLUNIT statement.
5. Specify UNIT=3350P for each 3350 that is attached to the paging storage director of a 3880 Model 11.

   Specify UNIT=3350 for each 3350 that is attached to the non-paging storage director of a 3880 Model 11, to a 3880 Model 1 or 2, or to a 3830.
6. Specify UNITADD=((aa,32)). Bits 3-7 of the binary value of the byte representing aa must be zeros.

   To identify the paging storage director of a 3880 Model 11 in the configuration reports, you can specify UNIT=3880P. The non-paging storage director of a 3880 Model 11 can be specified UNIT=3880.
7. Specify UNIT=3351P for each 3350 that is attached to the paging storage director of a 3880 Model 21.
8. Specify UNITADD=((aa,16)). Bits 4-7 of the binary value of the byte representing aa must be zeros.

   To identify the paging storage director of a 3880 Model 21 in the configuration reports, you can specify UNIT=3880P. The non-paging storage director of a 3880 Model 21 can be specified UNIT=3880.
9. When you are using the 5081 in a 3250 compatibility mode, specify the 5081 as UNIT=2250, MODEL=3. When you are using the 5081 in full function mode, specify the 5080 as UNIT=HFGD. For more information, see *Graphics Access Method/System Product: Initialization, Resource Definition, and Customization*, SC33-0141.

   The 5088 device can run either in DC interlock protocol or in data-streaming protocol, depending on the channel. Ensure that the interface protocol specified matches the protocol specified in the 5088.
10. For a 3272 attached to a block-multiplexer channel path, the recommended specification is SHARED=Y if multiple devices are attached to the control unit. SHARED=N is required if a 3272 is attached to a byte multiplexer channel path.

    When multiple devices are attached to the control unit and SHARED=N is specified, the possibility of additional overhead in the control program increases because of deferred condition code 1 I/O interruptions. If a single device is attached to the control unit, SHARED=N can be specified without increasing the overhead in the control program for interruption processing.
11. For a 3174 or 3274 attached to a block-multiplexer channel path, the recommended specification is SHARED=Y if multiple devices are attached to the control unit. If necessary, you can specify SHARED=N when multiple devices are attached to the control unit. However, specifying SHARED=N

increases the possibility of additional overhead in the control program resulting from deferred condition code 1 I/O interruptions.

If a single device is attached to the control unit (as is always the case for the 3174 (SNA) or 3274 Model 1A), SHARED=N can be specified and does not increase the overhead in the control program for interruption processing.

12. The control unit can run in either DC interlock protocol or data-streaming protocol, depending on the channel. Ensure that the interface protocol specified matches the protocol specified in the CNTLUNIT statement.
13. Attach the 3800 to a block-multiplexer channel (TYPE=CVC) for best system performance.
14. Specify TIMEOUT=Y when IBM-supplied programs are used with the 3800. Non-IBM programs might require TIMEOUT=N for the 3800 because I/O requests might require more than 4 seconds to complete.
15. If the magnetic tape subsystem contains two to four control units that access the same group of magnetic tape units, define each control unit separately. Each of the control units must have a different channel path identifier, but all of the control units should specify the same address range. Specify in the IODEVICE statement that the magnetic tape units are attached to all of the control units. (The magnetic tape units may actually be only logically attached, but they are specified as though they are physically attached.)
16. For HCD users, specify the 2540 with two IODEVICE statements: one with UNIT=2540R, the other with UNIT=2540P. See the z/OS Considerations box on page D-5.
17. For HCD users, for the 3203, only the Model 5 is supported. See the z/OS Considerations box on page D-5.
18. For HCD users, a 3174 (SNA) or 3274 Model A is specified as a 3791L in the IODEVICE statement. See the z/OS Considerations box on page D-5.
19. For the channel-to-channel adapter (CTCA), specify TIMEOUT=N because I/O sequences on the CTCA might require more than 4 seconds to complete. Because TIMEOUT=N, the CTCA cannot be attached to a byte multiplexer channel path.
20. For HCD users, in the UNIT parameter, you can specify any device or line that is attached to the 2701. See the z/OS Considerations box on page D-5.
21. For HCD users, in the UNIT parameter, you can specify any device or line that is attached to the 3704, 3705, 3725, and 3745. (This applies only to emulation program [EP] mode and byte multiplexer mode.) See the z/OS Considerations box on page D-5.
22. For a 3088, specify UNITADD=b0 and ADDRESS=(aaa,n), where n=32 or n=64, depending on the number of unit addresses required.
23. For a 3088, specify UNITADD=((a0,*n*)), where *n*=32 or *n*=64, depending on the number of unit addresses required.
24. For HCD users, the UNIT type should indicate the mode of operation for the device. If the device is set to 3380 track compatibility mode, use UNIT=3380. See the z/OS Considerations box on page D-5.
25. For a 3480 (all models) or a 3490 or 3490E (Models A*xx* or B*xx*), specify UNITADD=((a0,16)).
26. For 2032, 2042, 9032, 9033, and SWCH, always code UNITADD=00.
27. For 2032, 2042, 9032, 9033, and SWCH, always code LINK=FE.
28. The 2105, 3490, 3490E, 3590, 3591, 3990, 3995, 9032, 9033, and SWCH control units require that the unit address range begin with 00 for ESCON channel paths CNC and FCV. The 2032, 2042, 2105, and 3590 control units

require that the unit address range begin with 00 for FICON channel path type FC. The 3990 requires that the unit address range begin with X'10' or X'20' if DASD string 0 is **not** installed. For more information, see *3990 Storage Control Planning, Installation, and Storage Administration Guide*, GA32-0100.

29. For devices assigned to OSC, OSD, OSE, or OSN channel paths, do not specify the STADET keyword because it is ignored.
30. IBM recommends that you specify one CNTLUNIT statement for each storage cluster in the IBM 9340 Direct Access Storage Subsystem.
31. Specify UNITADD =((*nn*,32)). Bits 3-7 of the binary value of the byte representing *nn* must be zeros.
32. Specify UNITADD=((*a*0,8)) or, if a Model 111 or Model 112 expansion unit is attached, specify UNITADD=((*a*0,16)), where *a* is any hexadecimal digit unless the channel paths are ESCON. For ESCON channel paths, specify UNITADD=((00,8)) or UNITADD=((00,16)).
33. For HCD users, you can program a Series/1 to emulate a control unit with devices. In the CNTLUNIT statement, specify in the UNIT keyword the type of control unit being emulated. In the IODEVICE statement, specify in the UNIT keyword the type of device being emulated. See the z/OS Considerations box on page D-5.
34. If you specify UNIT=SCTC for devices assigned to ESCON CTC channels, the I/O subsystem uses extended mode CTC. The I/O subsystem always uses extended mode CTC for devices assigned to FICON CTC control units.
35. To run applications that require parallel basic mode CTC support using ESCON channels, specify UNIT=BCTC. Only the ESCON CTC channel end of the ESCON CTC connection needs the UNIT=BCTC specification. If UNIT=BCTC is not specified, the I/O subsystem uses extended mode CTC.
36. The description is valid only for devices on channel-attached non-SNA 3174s and 3274s. Devices on channel-attached SNA 3x74s are not defined separately so only the SNA control unit must be coded in an IODEVICE statement. See the “Communication Controllers” section in Table D-1 on page D-2.
37. 3174s operating as a Token Ring or ISDN gateway should have only one IODEVICE and one CNTLUNIT statement. The number value must be coded for both the ADDRESS= parameter in the IODEVICE statement and the UNITADD= parameter in the CNTLUNIT statement to match the address range the 3174 gateway supports.
38. For a 3490 or 3490E (Models C*xx* or D*xx*), specify UNITADD=((a0,2)).
39. For HCD users, specify UNIT=3480. See the z/OS Considerations box on page D-5.
40. For HCD users, specify UNIT=3490. See the z/OS Considerations box on page D-5.
41. For a 3490 or 3490E (Models A*xx* or B*xx*) that is part of a 3495 tape library dataserver, specify UNITADD=*b*0 and ADDRESS=(*aaa*,16) regardless of the number of devices installed. For a 3490E (Models C*xx*) that is part of a 3494 tape library dataserver, specify UNITADD=*b*0 and ADDRESS=(*aaa*,2).
42. For information on configuring devices for OSA channels, see “OSA Configuration Considerations” on page 1-25.

    Note: OSA channels identify themselves as machine type 1730.

    For further information on OSA configuration requirements for client server applications, see *Open Systems Adapter-Express Customer’s Guide and*

Reference, SA22-7935. For additional information on OSA-ICC configuration requirements, see *Open Systems Adapter-Express Integrated Console Controller User's Guide*, SA22-7990.

43. For a 3590 or 3591, specify UNITADD=((00,4)). For a 3590 Model A60, specify UNITADD=((00,*x*)), where *x* is the number of devices supported by the tape controller regardless of the number of devices installed.
44. Refer to the following documents for information on the 3746:
    - *3745 Communication Controller Model A and 3746 Nways Multiprotocol Controller Models 900 and 950 Planning Series: ESCON Channels*, GA27-4237
    - *3745 Communication Controller Model A and 3746 Nways Multiprotocol Controller Models 900 and 950 Planning Series: Overview, Installation, and Integration*, GA27-4234.
45. For a 3590 that is part of a 3494 or 3495 Tape Library Dataserver, specify UNITADD=00 and ADDRESS=(*aaa*,4) regardless of the number of devices installed. For a 3590 Model A60, specify UNITADD=00 and ADDRESS=(*aaa*,*x*) where *x* is the number of devices supported by the tape controller regardless of the number of devices installed.
46. For a 3490 Model A02 and a 3490E Model A20, specify a preferred path for each device so that the devices are divided between the two control unit functions. For example, you can specify the devices with even unit addresses to have preferred paths to the first control unit and unit addresses with odd unit addresses to have preferred paths to the second control unit. Also, if a control unit function has multiple paths, assign the paths equally as preferred paths to the devices.

    For a 3590, all 3490 models other than A02 and all 3490E models other than A20 do not specify a preferred path.
47. Specify UNITADD=((*nn*,8)).
48. For maximum availability of a control unit attached to an ESCON Director (including the control unit associated with LINK address FE), consider these guidelines in the following order of priority:
    - Attach each channel path from the same CPC to separate ESCON Directors
    - Attach each channel path to a separate port card quadrant in the ESCON Director
    - Attach each channel path within the same quadrant to a separate port card in the ESCON Director.
49. For HCD users with 3380 format devices attached to a 2105, you can specify 3380 parallel access volume (PAV) base devices as 3380B and aliases as 3380A. For 3390 format devices attached to a 2105, you can specify 3390 PAV base devices as 3390B and aliases as 3390A.
50. For the 2105, one CNTLUNIT statement must be specified for each logical subsystem (LSS). Specify the CUADD keyword with a value that matches the CU image address associated with the LSS.

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In This Appendix

This appendix presents several examples to illustrate key concepts associated with the different types of channel paths that IOCP supports. The IOCP inputs included with each figure show the proper way to code the configuration. The examples do not always illustrate configurations designed for reliability, availability, or serviceability.

More Than Eight Paths to an ESCON Device

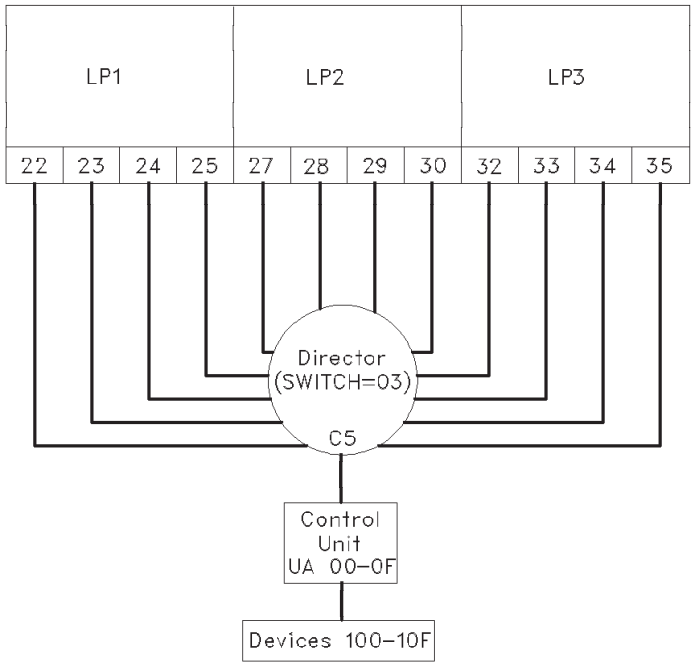


Figure E-1. LPAR Mode with More Than Eight Paths to an ESCON Device

IOCP Input for the Configuration

```
RESOURCE PART=(LP1,LP2,LP3)

CHPID PCHID=100,PATH=22,TYPE=CNC,PART=LP1,SWITCH=03
CHPID PCHID=101,PATH=23,TYPE=CNC,PART=LP1,SWITCH=03
CHPID PCHID=102,PATH=24,TYPE=CNC,PART=LP1,SWITCH=03
CHPID PCHID=103,PATH=25,TYPE=CNC,PART=LP1,SWITCH=03
CHPID PCHID=104,PATH=27,TYPE=CNC,PART=LP2,SWITCH=03
CHPID PCHID=105,PATH=28,TYPE=CNC,PART=LP2,SWITCH=03
CHPID PCHID=106,PATH=29,TYPE=CNC,PART=LP2,SWITCH=03
CHPID PCHID=107,PATH=30,TYPE=CNC,PART=LP2,SWITCH=03
CHPID PCHID=108,PATH=32,TYPE=CNC,PART=LP3,SWITCH=03
CHPID PCHID=109,PATH=33 TYPE=CNC,PART=LP3,SWITCH=03
CHPID PCHID=10A,PATH=34,TYPE=CNC,PART=LP3,SWITCH=03
CHPID PCHID=10B,PATH=35,TYPE=CNC,PART=LP3,SWITCH=03

CNTLUNIT CUNUMBR=000,PATH=(22,23,24,25),UNITADD=((00,16)),UNIT=XXXX,  X
              LINK=(C5,C5,C5,C5)

CNTLUNIT CUNUMBR=1000,PATH=(27,28,29,30),UNITADD=((00,16)),UNIT=XXXX, X
              LINK=(C5,C5,C5,C5)

CNTLUNIT CUNUMBR=2000,PATH=(32,33,34,35),UNITADD=((00,16)),UNIT=XXXX, X
              LINK=(C5,C5,C5,C5)
```

```
IODEVICE ADDRESS=(100,16),CUNUMBR=000,UNIT=XXXX
IODEVICE ADDRESS=(100,16),CUNUMBR=1000,UNIT=XXXX
IODEVICE ADDRESS=(100,16),CUNUMBR=2000,UNIT=XXXX
```

Shared Paths to an ESCON Device

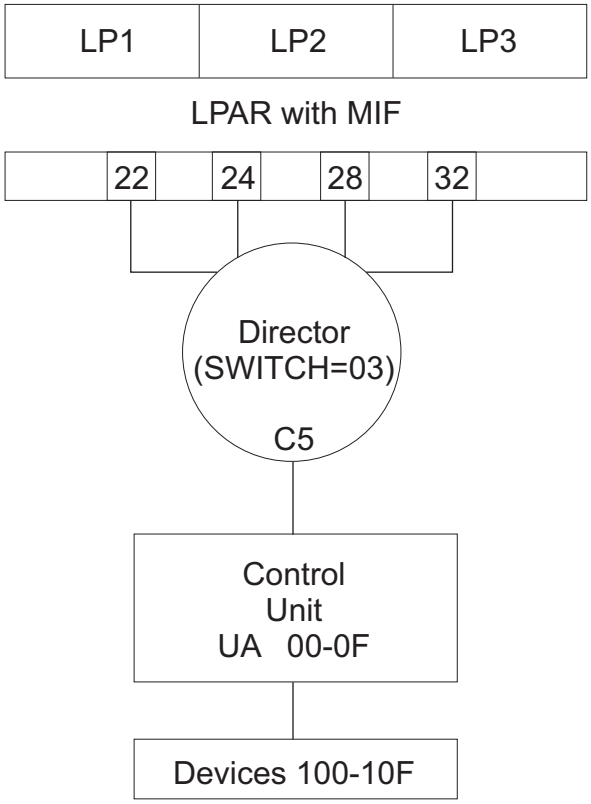


Figure E-2. LPAR Mode with Shared Paths to an ESCON Device

IOCP Input for the Configuration

```
RESOURCE PARTITION=(LP1,LP2,LP3)

CHPID PCHID=100,PATH=22,TYPE=CNC,SWITCH=03,SHARED
CHPID PCHID=101,PATH=24,TYPE=CNC,SWITCH=03,SHARED
CHPID PCHID=102,PATH=28,TYPE=CNC,SWITCH=03,SHARED
CHPID PCHID=103,PATH=32,TYPE=CNC,SWITCH=03,SHARED

CNTLUNIT CUNUMBR=000,PATH=(22,24,28,32),UNITADD=((00,16)),UNIT=XXXX,  X
             LINK=(C5,C5,C5,C5)

IODEVICE ADDRESS=(100,16),CUNUMBR=000,UNIT=XXXX
```

ESCON CTC Point-to-Point

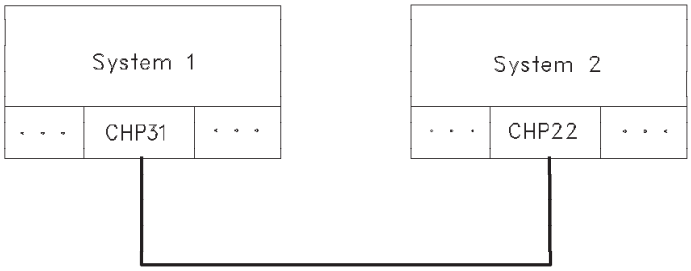


Figure E-3. ESCON CTC Point-to-Point

IOCP Input for System 1 Configuration

```
RESOURCE PART=SYSTEM1

CHPID PCHID=100,PATH=(31),TYPE=CNC,PART=SYSTEM1

CNTLUNIT CUNUMBR=000,PATH=(31),UNITADD=((00,1)),UNIT=SCTC

IODEVICE ADDRESS=100,CUNUMBR=000,UNIT=SCTC
```

IOCP Input for System 2 Configuration

```
RESOURCE PART=SYSTEM2

CHPID PCHID=100,PATH=(22),TYPE=CNC,PART=SYSTEM2

CNTLUNIT CUNUMBR=100,PATH=(22),UNITADD=((00,1)),UNIT=SCTC

IODEVICE ADDRESS=200,CUNUMBR=100,UNIT=SCTC
```

Note: You must specify the same unit address for devices from different logical partitions to communicate with each other (`00` in this example). This example assumes that the application program supports send and receive functions on a single device number.

ESCON CTC Dynamic Through an ESCON Director with Multiple Paths

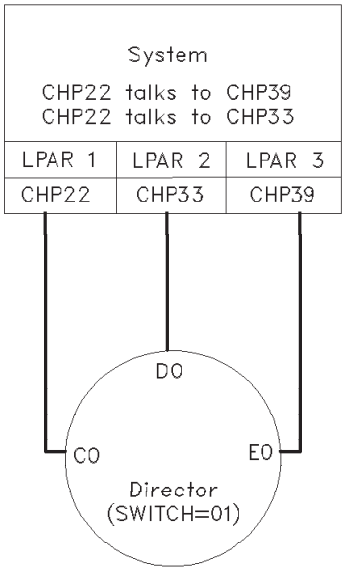


Figure E-4. ESCON CTC Dynamic Through an ESCON Director with Multiple Paths

IOCP Input for the Configuration

```
 RESOURCE PART=(LPAR1,LPAR2,LPAR3)

CHPID PATH=(22),TYPE=CTC,SWITCH=01,PART=LPAR1,PCHID=100
CHPID PATH=(33),TYPE=CNC,SWITCH=01,PART=LPAR2,PCHID=101
CHPID PATH=(39),TYPE=CNC,SWITCH=01,PART=LPAR3,PCHID=102

CNTLUNIT CUNUMBR=000,PATH=(22),UNITADD=((00,1)),UNIT=SCTC,      X
              LINK=D0
IODEVICE ADDRESS=100,CUNUMBR=000,UNIT=SCTC

CNTLUNIT CUNUMBR=001,PATH=(22),UNITADD=((10,1)),UNIT=SCTC,      X
              LINK=E0
IODEVICE ADDRESS=110,CUNUMBR=001,UNIT=SCTC

CNTLUNIT CUNUMBR=002,PATH=(33),UNITADD=((00,1)),UNIT=SCTC,      X
              LINK=C0
IODEVICE ADDRESS=200,CUNUMBR=002,UNIT=SCTC

CNTLUNIT CUNUMBR=003,PATH=(39),UNITADD=((10,1)),UNIT=SCTC,      X
              LINK=C0
IODEVICE ADDRESS=210,CUNUMBR=003,UNIT=SCTC
```

Note: You must specify the same unit address for devices from different logical partitions to communicate with each other. In this example, device 100 in LPAR1 can communicate with device 200 in LPAR2. Also, device 110 in LPAR1 can communicate with device 210 in LPAR3. This example assumes that the application program supports send and receive functions on a single device number.

FICON CTC and Director with Single Path

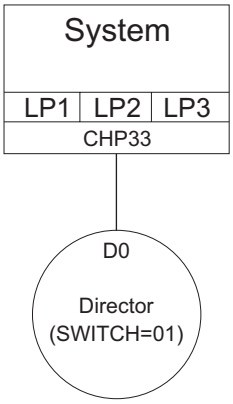


Figure E-5. FICON CTC and Director with Single Path

IOCP Input for the Configuration

```
 RESOURCE PARTITION=((LP1,1),(LP2,2),(LP3,3))
*
 CHPID PATH=(33),TYPE=FC,SWITCH=01,PART=(LP1,LP2,LP3),SHARED,PCHID=180
*
 CNTLUNIT CUNUMBR=4010,PATH=33,LINK=D0,UNIT=FCTC,UNITADD=((00,2)),CUADD=1
 IODEVICE ADDRESS=(4010,2),CUNUMBR=4010,UNIT=FCTC,UNITADD=00,NOTPART=LP1
*
 CNTLUNIT CUNUMBR=4020,PATH=33,LINK=D0,UNIT=FCTC,UNITADD=((00,2)),CUADD=2
 IODEVICE ADDRESS=(4020,2),CUNUMBR=4020,UNIT=FCTC,UNITADD=00,NOTPART=LP2
*
 CNTLUNIT CUNUMBR=4030,PATH=33,LINK=D0,UNIT=FCTC,UNITADD=((00,2)),CUADD=3
 IODEVICE ADDRESS=(4030,2),CUNUMBR=4030,UNIT=FCTC,UNITADD=00,NOTPART=LP3
```

Note: You must specify the same unit address for devices from different logical partitions to communicate with each other. In this example, each logical partition can communicate with the other logical partitions. This example defines separate send and receive devices to be used by an application program as follows:

- LP1 sends data to LP2 with device 4020 and LP3 with device 4030. LP2 and LP3 both receive data from LP1 with device 4010.
- LP2 and LP3 send data to LP1 with device 4011. LP1 receives data from LP2 with device 4021 and from LP3 with device 4031.
- LP2 sends data to LP3 with device 4030. LP3 receives data from LP2 with device 4020.
- LP3 sends data to LP2 with device 4021. LP2 receives data from LP3 with device 4031.

Chained ESCON Directors

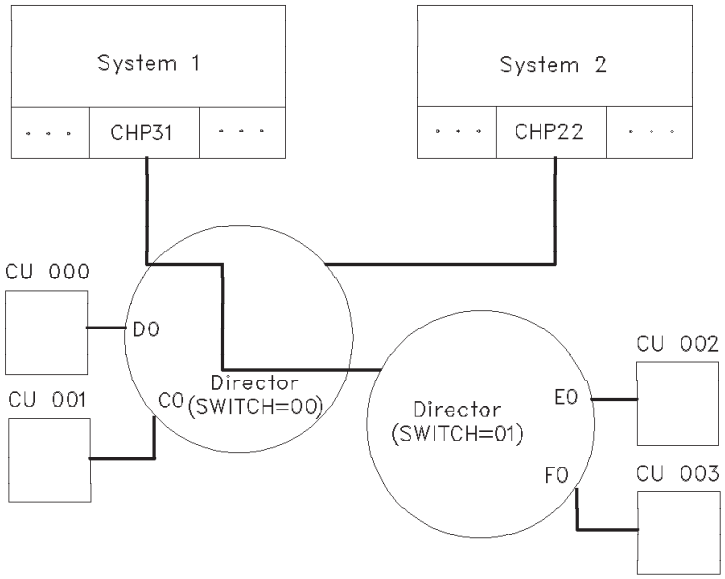


Figure E-6. Chained ESCON Directors

IOCP Input for System 1 Configuration

```
RESOURCE PART=SYSTEM1

CHPID PCHID=100,PATH=(31),TYPE=CNC,SWITCH=01,PART=SYSTEM1

CNTLUNIT CUNUMBR=002,PATH=(31),UNITADD=((00,1)),UNIT=XXX,      X
              LINK=E0

CNTLUNIT CUNUMBR=003,PATH=(31),UNITADD=((00,1)),UNIT=XXX,      X
              LINK=F0
```

Note: Channel path (*chpid*) 31 has a dedicated connection through ESCON Director 00 and two dynamic connections through ESCON Director 01.

IOCP Input for System 2 Configuration

```
RESOURCE PART=SYSTEM2

CHPID PCHID=180,PATH=(22),TYPE=CNC,SWITCH=00,PART=SYSTEM2

CNTLUNIT CUNUMBR=000,PATH=(22),UNITADD=((00,1)),UNIT=XXX,      X
              LINK=D0
CNTLUNIT CUNUMBR=001,PATH=(22),UNITADD=((00,1)),UNIT=XXX,      X
              LINK=C0
```

Note: Channel path (*chpid*) 22 has two dynamic connections through ESCON Director 00 and has no connection to ESCON Director 01.

Cascaded FICON Directors

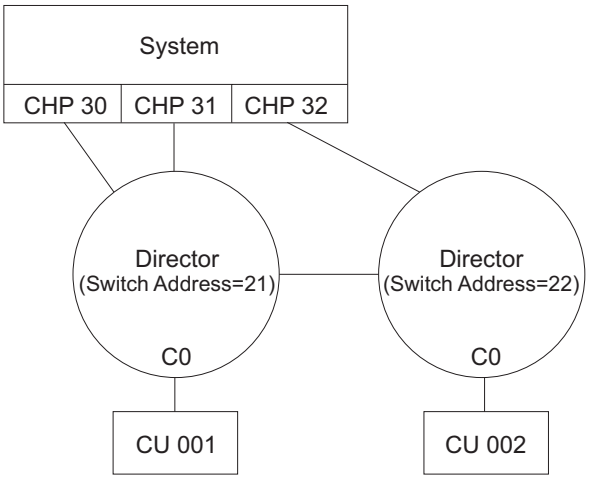


Figure E-7. Cascaded FICON Directors

IOCP Input for the Configuration

```
RESOURCE PART=(LP1,LP2,LP3)

CHPID PCHID=100,PATH=30,TYPE=FC,SWITCH=21,SHARED
CHPID PCHID=101,PATH=31,TYPE=FC,SWITCH=21,SHARED
CHPID PCHID=120,PATH=32,TYPE=FC,SWITCH=22,SHARED

CNTLUNIT CUNUMBR=001,PATH=(30,31,32),LINK=(C0,21C0,21C0),UNIT=XXX,...
CNTLUNIT CUNUMBR=002,PATH=(31,32),LINK=(22C0,22C0),UNIT=XXX,...
```

Note: In this example, the switch numbers specified for the FICON Directors match the switch addresses assigned to the Directors through their switch control panels.

In this example, *chipds* 30, 31, and 32 are attached to control unit 001. *Chpid* 30 communicates only to control units attached to switch 21 so it has used a 2-digit link address (C0) even though the switch is configured with the high integrity attributes and supports 4-digit link addresses. *Chpids* 31 and 32 communicate to control units that are not connected to their entry switches so they must have 4-digit link addresses. The first two digits identify the switch address and the last two digits identify the port address to which the control unit is attached. Link address 21C0 identifies port C0 on the switch with switch address 21. Link address 22C0 identifies port C0 on the switch with switch address 22. I/O for control unit 001 for *chpid* 32 flows through both switches while *chpid* 31 uses only switch 21. I/O for control unit 002 for *chpid* 31 flows through both switches while *chpid* 32 uses only switch 22.

Note: This example does not follow all recommendations. For example, *chpid* 31 connects to switch 21 and uses 4-digit link addresses while *chpid* 30 also connects to switch 21 but uses 2-digit link addresses. When a 4-digit link address is specified for a channel path, all channel paths connected to the same entry switch should also specify 4-digit link addresses so IOCP can perform better checking of the switch configuration. See “Defining FICON Switch Configurations” on page 1-30 for more information on cascading switches and specifying link addresses for FC channel paths.

Control Unit Logical Addressing

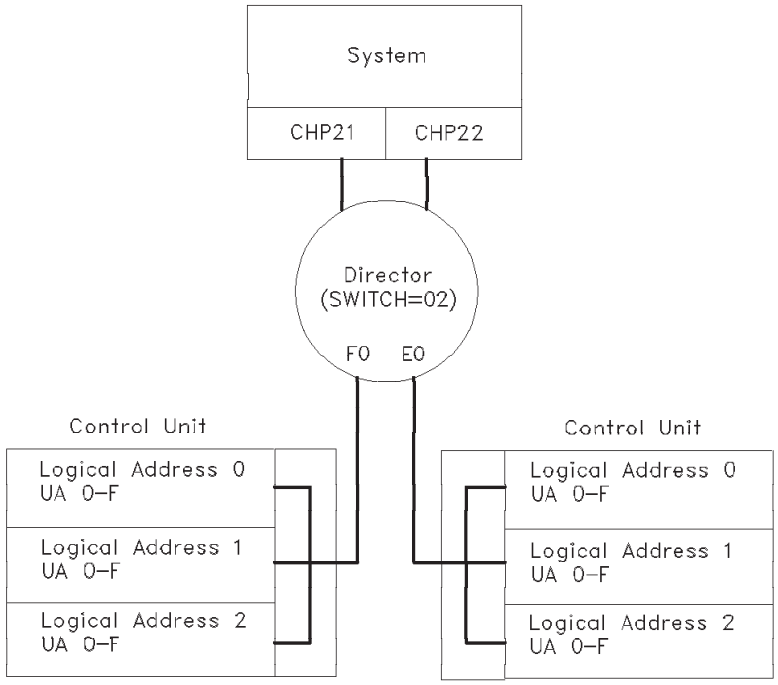


Figure E-8. Control Unit Logical Addressing

IOCP Input for the Configuration

```
CHPID PATH=(21),TYPE=CNC,SWITCH=02,...
CHPID PATH=(22),TYPE=CNC,SWITCH=02,...

CNTLUNIT CUNUMBR=000,PATH=(21,22),UNITADD=((00,16)),UNIT=XXXX,      X
             LINK=(F0,F0),CUADD=0

CNTLUNIT CUNUMBR=001,PATH=(21,22),UNITADD=((00,16)),UNIT=XXXX,      X
             LINK=(F0,F0),CUADD=1

CNTLUNIT CUNUMBR=002,PATH=(21,22),UNITADD=((00,16)),UNIT=XXXX,      X
             LINK=(F0,F0),CUADD=2

CNTLUNIT CUNUMBR=100,PATH=(21,22),UNITADD=((00,16)),UNIT=XXXX,      X
             LINK=(E0,E0),CUADD=0

CNTLUNIT CUNUMBR=101,PATH=(21,22),UNITADD=((00,16)),UNIT=XXXX,      X
             LINK=(E0,E0),CUADD=1

CNTLUNIT CUNUMBR=102,PATH=(21,22),UNITADD=((00,16)),UNIT=XXXX,      X
             LINK=(E0,E0),CUADD=2
```

Channels Through an ESCON Converter

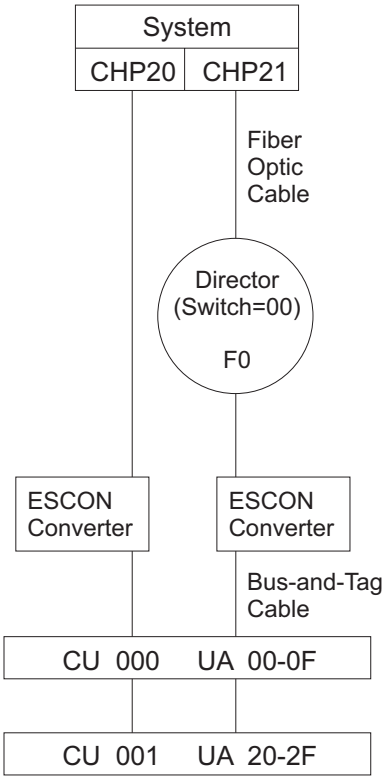


Figure E-9. Channels Through an ESCON Converter

IOCP Input for the Configuration

```
RESOURCE PART=LP1

CHPID PCHID=100,PATH=20,TYPE=CVC,PART=LP1
CHPID PCHID=101,PATH=21,TYPE=CVC,PART=LP1,SWITCH=00

CNTLUNIT CUNUMBR=000,PATH=(20,21),UNITADD=((00,16)),UNIT=XXX,    X
              LINK=(**,F0),SHARED=N

CNTLUNIT CUNUMBR=001,PATH=(20,21),UNITADD=((20,16)),UNIT=XXX,    X
              LINK=(**,F0),SHARED=N
```

FCV Channel Configuration

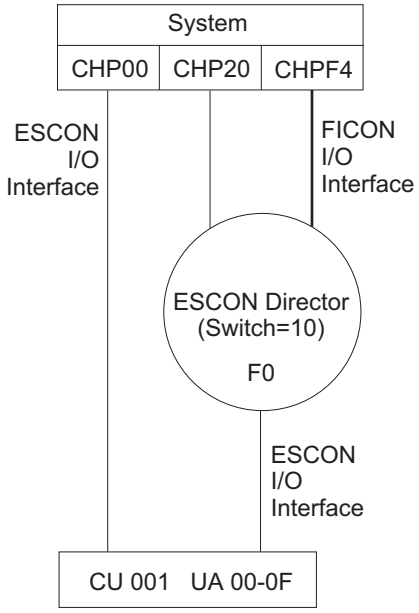


Figure E-10. FCV Channel Configuration

IOCP Input for the Configuration

```
CHPID PATH=(00),TYPE=CNC,...
CHPID PATH=(20),TYPE=CNC,SWITCH=10,...
CHPID PATH=(F4),TYPE=FCV,SWITCH=10,...

CNTLUNIT CUNUMBR=001,PATH=(00,20,F4),LINK=(**,F0,F0),UNIT=XXX,   X
              UNITADD=((00,16))
```

ESCON Control Units Requiring Unit Address 00

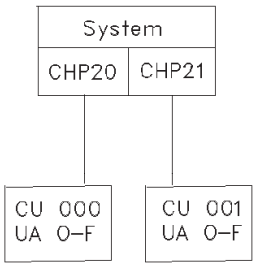


Figure E-11. ESCON Control Units Requiring Unit Address 00

IOCP Input for the Configuration

```
RESOURCE PART=(LP1,LP2,LP3)

CHPID PCHID=100,PATH=20,TYPE=CNC,SHARED
CHPID PCHID=101,PATH=21,TYPE=CNC,SHARED

CNTLUNIT CUNUMBR=000,PATH=(20),UNITADD=((00,16)),UNIT=XXX
IODEVICE ADDRESS=(100,16),CUNUMBR=000,UNIT=XXX

CNTLUNIT CUNUMBR=001,PATH=(21),UNITADD=((00,16)),UNIT=XXX
IODEVICE ADDRESS=(130,16),CUNUMBR=001,UNIT=XXX,UNITADD=00
```

Devices 100-10F default to unit addresses 00-0F and are recognized by control unit 000.

Devices 130-13F default to unit addresses 30-3F and are not recognized by control unit 001. To keep these devices online, specify `UNITADD=00`.

OSA Configuration with Two Logical Partitions

Two different home IP addresses are specified in the TCP/IP profile and two different TRLE (transport resource list element) statements are defined. Because the channel path is shared, both logical partitions have access to the READ, WRITE, and DATAPATH devices.

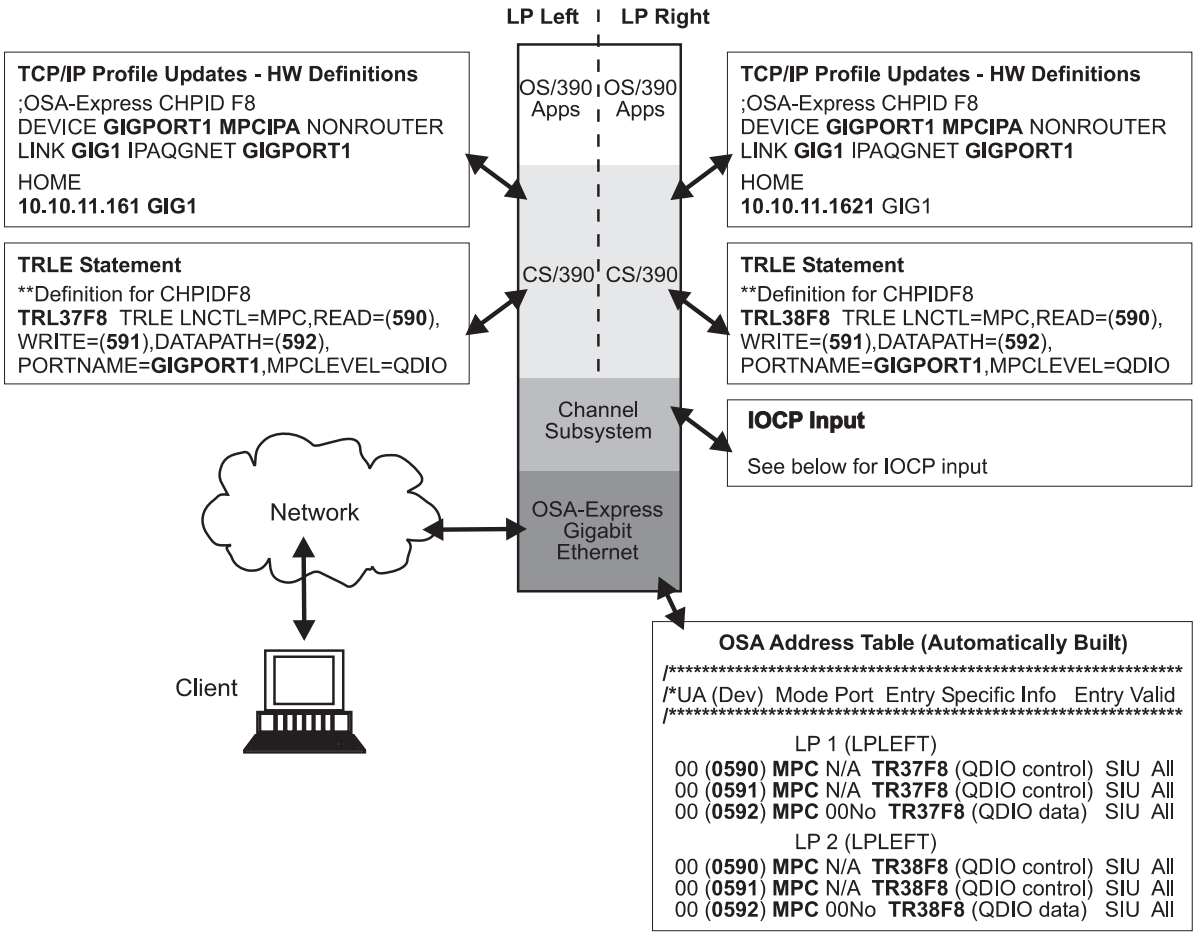


Figure E-12. OSA Configuration with Two Logical Partitions

IOCP Input for the Configuration

```
RESOURCE PART=(LPLEFT,LPRIGHT)

CHPID PATH=F8,TYPE=OSD,PART=((LPLEFT,LPRIGHT),(=)),PCHID=180
CNTLUNIT CUNUMBR=F800,PATH=F8,UNIT=OSA
IODEVICE ADDRESS=(590,3),CUNUMBR=F800,UNIT=OSA
```

Additional OSA Configuration Examples

For additional OSA configuration examples, see *Open Systems Adapter-Express Customer's Guide and Reference*, SA22-7935.

OSA-ICC Configuration

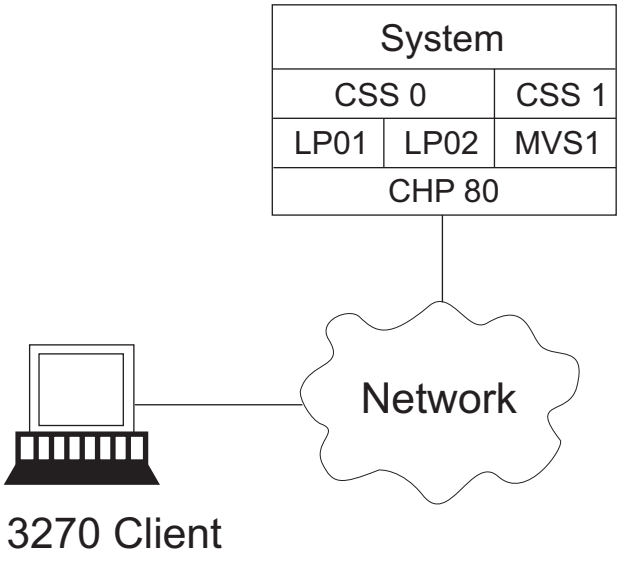


Figure E-13. OSA-ICC

IOCP Input for the Configuration

```
RESOURCE PART=((CSS(0),(LP01,1),(LP02,2)),(CSS(1),(MVS1,2)))
CHPID PCHID=1C0,PATH=(CSS(0,1),80),TYPE=OSC
CNTLUNIT CUNUMBR=1000,PATH=((CSS(0),80),(CSS(1),80)),UNIT=OSC
IODEVICE ADDRESS=(2400,80),CUNUMBR=1000,UNIT=3270,MODEL=X
```

Partial Manual Session Configuration File

```
<CONFIG_SESSION>
<SESSION1>
 CLIENT_IP= 10.10.10.15
 CSS=  00 MIFID=  01 DEVICE= 2400
 GROUP= "OSA01"
 CONSOLE_TYPE=  2  RESPONSE=  ON  READ_TIMEOUT=  10
</SESSION1>

<SESSION2>
 CLIENT_IP=  10.10.10.15
 CSS=  00 MIFID=  01 DEVICE=  2401
 GROUP= "OSA01"
 CONSOLE_TYPE=  1  RESPONSE=  ON  READ_TIMEOUT=  10
</SESSION2>

<SESSION3>
 CLIENT_IP=  10.10.10.15
 CSS=  00 MIFID=  02 DEVICE=  2400
 GROUP= "OSA02"
 CONSOLE_TYPE=  1  RESPONSE=  ON  READ_TIMEOUT=  10
</SESSION3>
   .
   .
   .

<SESSION9>
 CLIENT_IP=  10.10.10.17
 CSS=  01 MIFID=  02 DEVICE=  2400
 GROUP= "OSA01"
 CONSOLE_TYPE=  1  RESPONSE=  ON  READ_TIMEOUT=  10
```

```
</SESSION9>

<SESSION10>
 CLIENT_IP=  10.10.10.18
 CSS=  01 MIFID=  02 DEVICE=  2401
 GROUP= "OSAXX13"   CONSOLE_TYPE=  1  RESPONSE=  ON  READ_TIMEOUT=  10
</SESSION10>
</CONFIG_SESSION>
```

Additional OSA-ICC Configuration Examples

For additional OSA-ICC configuration examples, see *Open Systems Adapter-Express Integrated Console Controller User's Guide*, SA22-7990.

FCP Channel Configuration

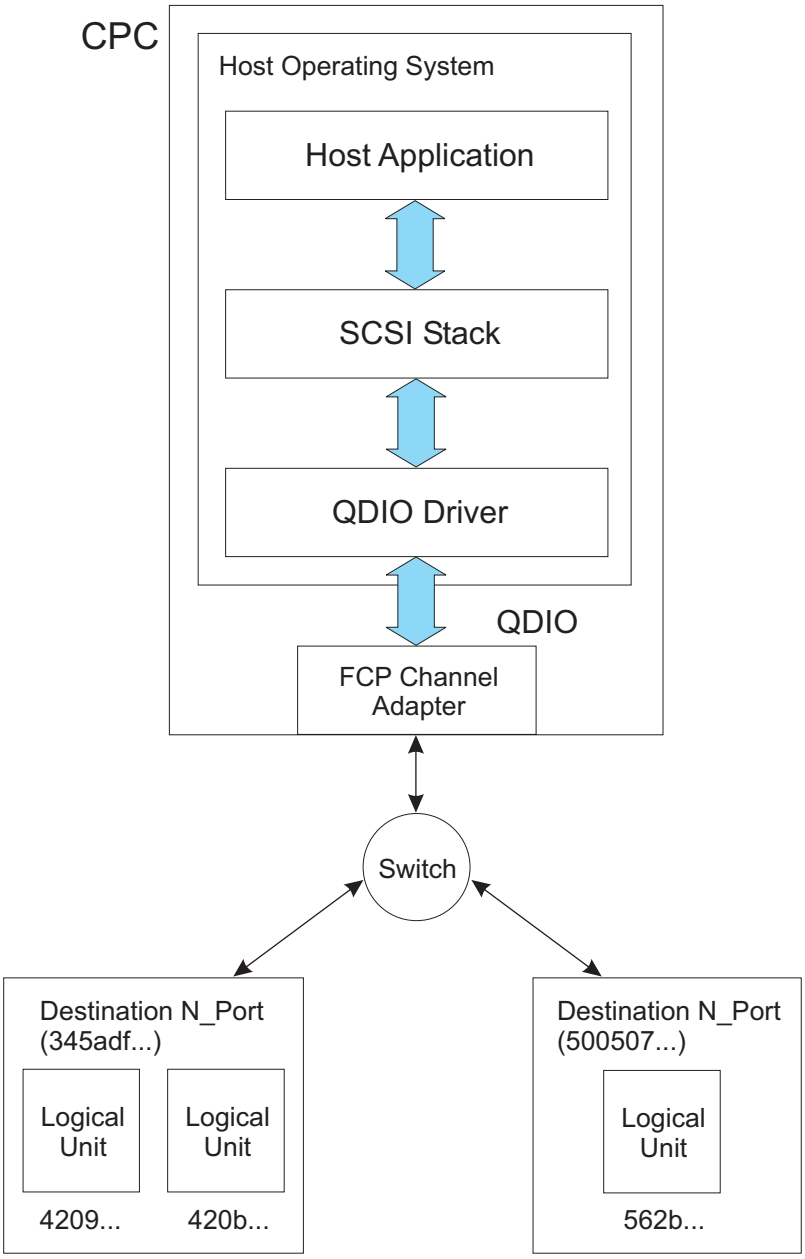


Figure E-14. FCP Channel Configuration

Partial Host Operating System Configuration Definition

```
0x 1200 ...:0x345adf3322443525 ...:0x4209000000000000
0x 1200 ...:0x345adf3322443525 ...:0x420b000000000000
0x 1200 ...:0x5005076300c40c85 ...:0x562b000000000000
```

IOCP Input for the Configuration

```
RESOURCE...

CHPID PATH=80,TYPE=FCP,...
CNTLUNIT CUNUMBR=1111,PATH=80,UNIT=...
IODEVICE ADDRESS=1200,CUNUMBR=1111,UNIT=...
```

Overview of the Configuration Definitions

A host operating system definition consists of multiple fields. The preceding example attempts to show the primary fields that are required to define FCP devices in a host operating system. It specifies two logical units for one target device and one logical unit for another target device. The first field shown is the device number (for example, 0x1200), which is the same device number specified in the IOCP definition. The next field shown is the World Wide Port Number (WWPN) identifying the Fibre Channel port of the SCSI target device (for example, 0x345adf...). The final field shown is the logical unit number (for example, 0x4209... and 0x420b...).

The IOCP definition consists of the FCP channel path, a control unit, which is only necessary so that devices can be defined, and a device. The device 1200 is associated with a subchannel in the logical channel subsystem (CSS).

A host application issues an I/O request. The SCSI/FCP stack gets the CSS subchannel number for the device number (1200) and packages the FCP I/O operation into a format acceptable for QDIO operations and passes it to the QDIO driver. The QDIO driver uses queues associated with the subchannel for device 1200 and performs the QDIO operation to the FCP channel adapter. The FCP channel performs the Fibre Channel Protocol operation with the correct destination logical unit (LUN) using the correct Fibre Channel port of the SCSI target device.

Coupling Facility Configuration

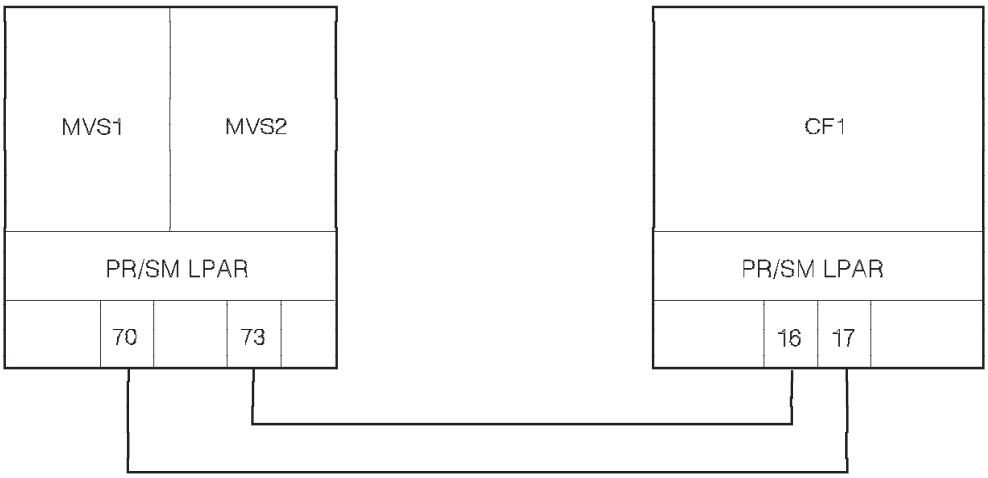


Figure E-15. Coupling Facility Configuration

IOCP Input for z/OS Configuration

```
RESOURCE PART=(MVS1,MVS2)

CHPID PATH=70,TYPE=CFS,PART=(MVS1,MVS2),PCHID=210
CHPID PATH=73,TYPE=CFS,PART=(MVS1,MVS2),PCHID=211

CNTLUNIT CUNUMBR=FFE,PATH=(70,73),UNIT=CFS

IODEVICE ADDRESS=(FFF8,2),CUNUMBR=FFE,UNIT=CFS
IODEVICE ADDRESS=(FFFC,2),CUNUMBR=FFE,UNIT=CFS
```

This example also applies to channel path types CBS, CFP, and CBP. A corresponding change would be required in the coupling facility configuration.

IOCP Input for Coupling Facility Configuration

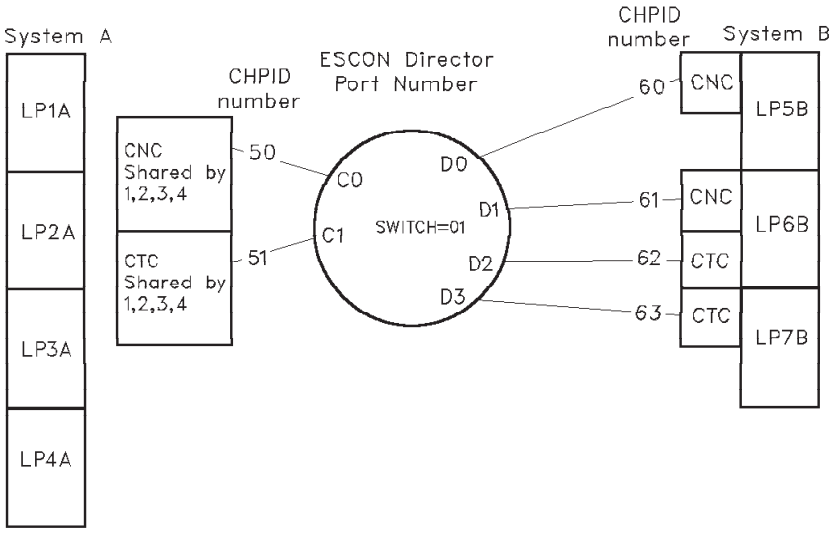
```
RESOURCE PART=CF1

CHPID PATH=16,TYPE=CFR,PART=CF1,PCHID=300
CHPID PATH=17,TYPE=CFR,PART=CF1,PCHID=301
```

ESCON CTC with Shared and Unshared Channels

CNC CHPID 50 and CTC CHPID 51 in System A are shared by LP1A, LP2A, LP3A, and LP4A. All partitions in the figure participate in an any-to-any CTC configuration. No redundancy is provided. All the channel paths on System B are unshared. For recommendations for numbering CTC control units and devices to simplify CTC configurations, see the *ESCON and FICON Channel-to-Channel Reference*, SB10-7034.

Four CTC communications are defined between each LP except for LP4A, which has six connections to each of the other LPs. See Figure E-16.

Note: All shared CTC examples within a single CPC exclude an LP from communicating with itself. This exclusion is required for some subsystems (for example, XCF). Other subsystems may not have this restriction and may support an LP's communicating with itself.



LP1A to LP2A: 50 to 51 (4 CTCs)
LP1A to LP3A: 50 to 51 (4 CTCs)
LP1A to LP4A: 50 to 51 (6 CTCs)
LP2A to LP3A: 50 to 51 (4 CTCs)
LP2A to LP4A: 50 to 51 (6 CTCs)
LP3A to LP4A: 50 to 51 (6 CTCs)

LP1A to LP5B: 51 to 60 (4 CTCs)
LP2A to LP5B: 51 to 60 (4 CTCs)
LP3A to LP5B: 51 to 60 (4 CTCs)
LP4A to LP5B: 51 to 60 (6 CTCs)

LP1A to LP6B: 51 to 61 (4 CTCs)
LP2A to LP6B: 51 to 61 (4 CTCs)
LP3A to LP6B: 51 to 61 (4 CTCs)
LP4A to LP6B: 51 to 61 (6 CTCs)

LP1A to LP7B: 50 to 63 (4 CTCs)
LP2A to LP7B: 50 to 63 (4 CTCs)
LP3A to LP7B: 50 to 63 (4 CTCs)
LP4A to LP7B: 50 to 63 (6 CTCs)

LP5B to LP6B: 60 to 62 (4 CTCs)
LP5B to LP7B: 60 to 63 (4 CTCs)
LP6B to LP7B: 61 to 63 (4 CTCs)

Figure E-16. ESCON CTC with Shared and Unshared Channels

IOCP Input for System A (Shared)

```
RESOURCE PARTITION=((LP1A,1),(LP2A,2),(LP3A,3),(LP4A,4))

CHPID PATH=50,TYPE=CNC,SWITCH=01,SHARED,...
CHPID PATH=51,TYPE=CTC,SWITCH=01,SHARED,...

**********************************************************************
* CTC wrap-around connections among LP1A, LP2A, LP3A, and LP4A
* Via CHPID 50 (CNC) in System A to CHPID 51 (CTC) in System A
*
```

```
* Define a control unit representing each partition sharing
* destination channel CHPID 51 (CTC) to source channel CHPID 50 (CNC).
*
* Representing LP1A:
 CNTLUNIT CUNUMBR=5010,PATH=50,LINK=C1,CUADD=1,UNITADD=((40,6)),UNIT=SCTC
* LP1A is excluded from PART keyword to disallow LP1A to LP1A CTC
 IODEVICE ADDRESS=(5010,4),CUNUMBR=5010,UNITADD=40,PART=(LP2A,LP3A,LP4A),UNIT=SCTC
 IODEVICE ADDRESS=(5014,2),CUNUMBR=5010,UNITADD=44,PART=LP4A,UNIT=SCTC
*
* Representing LP2A:
 CNTLUNIT CUNUMBR=5020,PATH=50,LINK=C1,CUADD=2,UNITADD=((40,6)),UNIT=SCTC
* LP2A is excluded from PART keyword to disallow LP2A to LP2A CTC
 IODEVICE ADDRESS=(5020,4),CUNUMBR=5020,UNITADD=40,PART=(LP1A,LP3A,LP4A),UNIT=SCTC
 IODEVICE ADDRESS=(5024,2),CUNUMBR=5020,UNITADD=44,PARTITION=LP4A,UNIT=SCTC
*
* Representing LP3A:
 CNTLUNIT CUNUMBR=5030,PATH=50,LINK=C1,CUADD=3,UNITADD=((40,6)),UNIT=SCTC
* LP3A is excluded from PART keyword to disallow LP3A to LP3A CTC
 IODEVICE ADDRESS=(5030,4),CUNUMBR=5030,UNITADD=40,PART=(LP1A,LP2A,LP4A),UNIT=SCTC
 IODEVICE ADDRESS=(5034,2),CUNUMBR=5030,UNITADD=44,PARTITION=LP4A,UNIT=SCTC
*
* Representing LP4A:
 CNTLUNIT CUNUMBR=5040,PATH=50,LINK=C1,CUADD=4,UNITADD=((40,6)),UNIT=SCTC
* LP4A is excluded from PART keyword to disallow LP4A to LP4A CTC
 IODEVICE ADDRESS=(5040,6),CUNUMBR=5040,UNITADD=40,PART=(LP1A,LP2A,LP3A),UNIT=SCTC
*
*
* Define a control unit representing each partition sharing
* destination channel CHPID 50 (CNC) to source channel CHPID 51 (CTC).
* Representing LP1A:
 CNTLUNIT CUNUMBR=5110,PATH=51,LINK=C0,CUADD=1,UNITADD=((40,6)),UNIT=SCTC
 IODEVICE ADDRESS=(5110,4),CUNUMBR=5110,UNITADD=40,PART=(LP2A,LP3A,LP4A),UNIT=SCTC
 IODEVICE ADDRESS=(5114,2),CUNUMBR=5110,UNITADD=44,PARTITION=LP4A,UNIT=SCTC
*
* Representing LP2A:
 CNTLUNIT CUNUMBR=5120,PATH=51,LINK=C0,CUADD=2,UNITADD=((40,6)),UNIT=SCTC
 IODEVICE ADDRESS=(5120,4),CUNUMBR=5120,UNITADD=40,PART=(LP1A,LP3A,LP4A),UNIT=SCTC
 IODEVICE ADDRESS=(5124,2),CUNUMBR=5120,UNITADD=44,PARTITION=LP4A,UNIT=SCTC
*
* Representing LP3A:
 CNTLUNIT CUNUMBR=5130,PATH=51,LINK=C0,CUADD=3,UNITADD=((40,6)),UNIT=SCTC
 IODEVICE ADDRESS=(5130,4),CUNUMBR=5130,UNITADD=40,PART=(LP1A,LP2A,LP4A),UNIT=SCTC
 IODEVICE ADDRESS=(5134,2),CUNUMBR=5130,UNITADD=44,PARTITION=LP4A,UNIT=SCTC
*
* Representing LP4A:
 CNTLUNIT CUNUMBR=5140,PATH=51,LINK=C0,CUADD=4,UNITADD=((40,6)),UNIT=SCTC
 IODEVICE ADDRESS=(5140,6),CUNUMBR=5140,UNITADD=40,PART=(LP1A,LP2A,LP3A),UNIT=SCTC
*********************************************************************
* CTC connections between (LP1A,LP2A,LP3A,LP4A) and LP5B
*
* Define a control unit representing destination channel CHPID 60 (CNC)
* to source channel CHPID 51 (CTC).
 CNTLUNIT CUNUMBR=5150,PATH=51,LINK=D0,CUADD=0,UNITADD=((40,6)),UNIT=SCTC
 IODEVICE ADDRESS=(5150,4),CUNUMBR=5150,UNITADD=40,UNIT=SCTC
 IODEVICE ADDRESS=(5154,2),CUNUMBR=5150,UNITADD=44,PART=LP4A,UNIT=SCTC
*********************************************************************
* CTC connections between (LP1A,LP2A,LP3A,LP4A) and LP6B
*
* Define a control unit representing destination channel CHPID 61 (CNC)
* to source channel CHPID 51 (CTC).
 CNTLUNIT CUNUMBR=5160,PATH=51,LINK=D1,CUADD=0,UNITADD=((40,6)),UNIT=SCTC
 IODEVICE ADDRESS=(5160,4),CUNUMBR=5160,UNITADD=40,UNIT=SCTC
 IODEVICE ADDRESS=(5164,2),CUNUMBR=5160,UNITADD=44,PART=LP4A,UNIT=SCTC
*********************************************************************
* CTC connections between (LP1A,LP2A,LP3A,LP4A) and LP7B
*
* Define a control unit representing destination channel CHPID 63 (CTC)
* to source channel CHPID 50 (CNC).
```

```
 CNTLUNIT CUNUMBR=5070,PATH=50,LINK=D3,CUADD=0,UNITADD=((40,6)),UNIT=SCTC
 IODEVICE ADDRESS=(5070,4),CUNUMBR=5070,UNITADD=40,UNIT=SCTC
 IODEVICE ADDRESS=(5074,2),CUNUMBR=5070,UNITADD=44,PART=LP4A,UNIT=SCTC
```

IOCP Input for System B (Unshared)

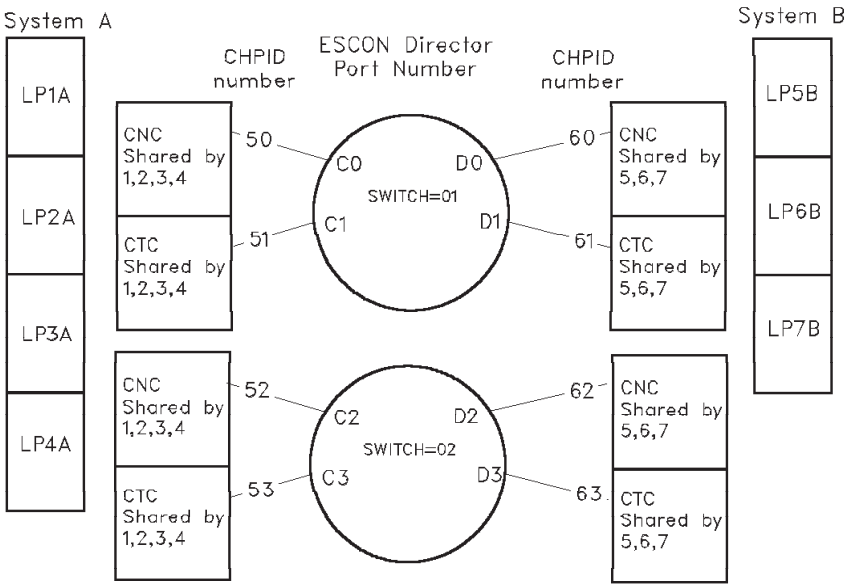
```
 CHPID PATH=60,TYPE=CNC,SWITCH=01,...
 CHPID PATH=61,TYPE=CNC,SWITCH=01,...
 CHPID PATH=62,TYPE=CTC,SWITCH=01,...
 CHPID PATH=63,TYPE=CTC,SWITCH=01,...

************************************************************
* CTC wrap-around connections among LP5B, LP6B, and LP7B
*
* Define a control unit representing destination channel CHPID 62 (CTC)
* to source channel CHPID 60 (CNC).
 CNTLUNIT CUNUMBR=6060,PATH=60,LINK=D2,UNITADD=((40,4)),UNIT=SCTC
 IODEVICE ADDRESS=(6060,4),CUNUMBR=6060,UNITADD=40,UNIT=SCTC
* Define a control unit representing destination channel CHPID 63 (CTC)
* to source channel CHPID 60 (CNC).
 CNTLUNIT CUNUMBR=6070,PATH=60,LINK=D3,UNITADD=((40,4)),UNIT=SCTC
 IODEVICE ADDRESS=(6070,4),CUNUMBR=6070,UNITADD=40,UNIT=SCTC
*
* Define a control unit representing destination channel CHPID 63 (CTC)
* to source channel CHPID 61 (CNC).
 CNTLUNIT CUNUMBR=6170,PATH=61,LINK=D3,UNITADD=((40,4)),UNIT=SCTC
 IODEVICE ADDRESS=(6170,4),CUNUMBR=6170,UNITADD=40,UNIT=SCTC
*
* Define a control unit representing destination channel CHPID 60 (CNC)
* to source channel CHPID 62 (CTC).
 CNTLUNIT CUNUMBR=6250,PATH=62,LINK=D0,UNITADD=((40,4)),UNIT=SCTC
 IODEVICE ADDRESS=(6250,4),CUNUMBR=6250,UNITADD=40,UNIT=SCTC
*
* Define a control unit representing destination channel CHPID 60 (CNC)
* to source channel CHPID 63 (CTC).
 CNTLUNIT CUNUMBR=6350,PATH=63,LINK=D0,UNITADD=((40,4)),UNIT=SCTC
 IODEVICE ADDRESS=(6350,4),CUNUMBR=6350,UNITADD=40,UNIT=SCTC
* Define a control unit representing destination channel CHPID 61 (CNC)
* to source channel CHPID 63 (CTC).
 CNTLUNIT CUNUMBR=6360,PATH=63,LINK=D1,UNITADD=((40,4)),UNIT=SCTC
 IODEVICE ADDRESS=(6360,4),CUNUMBR=6360,UNITADD=40,UNIT=SCTC
************************************************************
* CTC connections between LP5B and (LP1A,LP2A,LP3A,LP4A)
* Via CHPID 60 (CNC) in System B to CHPID 51 (CTC) in System A
*
* Define a control unit representing each partition sharing
* destination channel CHPID 51 (CTC) to source channel CHPID 60 (CNC).
*
* Representing LP1A:
 CNTLUNIT CUNUMBR=6010,PATH=60,LINK=C1,CUADD=1,UNITADD=((40,4)),UNIT=SCTC
 IODEVICE ADDRESS=(6010,4),CUNUMBR=6010,UNITADD=40,UNIT=SCTC
* Representing LP2A:
 CNTLUNIT CUNUMBR=6020,PATH=60,LINK=C1,CUADD=2,UNITADD=((40,4)),UNIT=SCTC
 IODEVICE ADDRESS=(6020,4),CUNUMBR=6020,UNITADD=40,UNIT=SCTC
* Representing LP3A:
 CNTLUNIT CUNUMBR=6030,PATH=60,LINK=C1,CUADD=3,UNITADD=((40,4)),UNIT=SCTC
 IODEVICE ADDRESS=(6030,4),CUNUMBR=6030,UNITADD=40,UNIT=SCTC
* Representing LP4A:
 CNTLUNIT CUNUMBR=6040,PATH=60,LINK=C1,CUADD=4,UNITADD=((40,6)),UNIT=SCTC
 IODEVICE ADDRESS=(6040,6),CUNUMBR=6040,UNITADD=40,UNIT=SCTC
************************************************************
* CTC connections between LP6B and (LP1A,LP2A,LP3A,LP4A)
* Via CHPID 61 (CNC) in System B to CHPID 51 (CTC) in System A
```

```
*
* Define a control unit representing each partition sharing
* destination channel CHPID 51 (CTC) to source channel CHPID 61 (CNC).
*
* Representing LP1A:
 CNTLUNIT CUNUMBR=6110,PATH=61,LINK=C1,CUADD=1,UNITADD=((40,4)),UNIT=SCTC
 IODEVICE ADDRESS=(6110,4),CUNUMBR=6110,UNITADD=40,UNIT=SCTC
* Representing LP2A:
 CNTLUNIT CUNUMBR=6120,PATH=61,LINK=C1,CUADD=2,UNITADD=((40,4)),UNIT=SCTC
 IODEVICE ADDRESS=(6120,4),CUNUMBR=6120,UNITADD=40,UNIT=SCTC
* Representing LP3A:
 CNTLUNIT CUNUMBR=6130,PATH=61,LINK=C1,CUADD=3,UNITADD=((40,4)),UNIT=SCTC
 IODEVICE ADDRESS=(6130,4),CUNUMBR=6130,UNITADD=40,UNIT=SCTC
* Representing LP4A:
 CNTLUNIT CUNUMBR=6140,PATH=61,LINK=C1,CUADD=4,UNITADD=((40,6)),UNIT=SCTC
 IODEVICE ADDRESS=(6140,6),CUNUMBR=6140,UNITADD=40,UNIT=SCTC
**************************************************************
* CTC connections between LP7B and (LP1A,LP2A,LP3A,LP4A)
* Via CHPID 63 (CTC) in System B to CHPID 50 (CNC) in System A
*
* Define a control unit representing each partition sharing
* destination channel CHPID 50 (CNC) to source channel CHPID 63 (CTC).
*
* Representing LP1A:
 CNTLUNIT CUNUMBR=6310,PATH=63,LINK=C0,CUADD=1,UNITADD=((40,4)),UNIT=SCTC
 IODEVICE ADDRESS=(6310,4),CUNUMBR=6310,UNITADD=40,UNIT=SCTC
* Representing LP2A:
 CNTLUNIT CUNUMBR=6320,PATH=63,LINK=C0,CUADD=2,UNITADD=((40,4)),UNIT=SCTC
 IODEVICE ADDRESS=(6320,4),CUNUMBR=6320,UNITADD=40,UNIT=SCTC
* Representing LP3A:
 CNTLUNIT CUNUMBR=6330,PATH=63,LINK=C0,CUADD=3,UNITADD=((40,4)),UNIT=SCTC
 IODEVICE ADDRESS=(6330,4),CUNUMBR=6330,UNITADD=40,UNIT=SCTC
* Representing LP4A:
 CNTLUNIT CUNUMBR=6340,PATH=63,LINK=C0,CUADD=4,UNITADD=((40,6)),UNIT=SCTC
 IODEVICE    ADDRESS=(6340,6),CUNUMBR=6340,UNITADD=40,UNIT=SCTC
```

ESCON CTC with Shared Channels

A fully redundant any-to-any CTC configuration consists of two sets of CTC minimum configurations, each associated with a separate ESCON Director. CTC communication workload between System A and System B is balanced between four CTC connections. All the channel paths are shared. See Figure E-17 on page E-24. For recommendations for numbering CTC control units and devices to simplify CTC configurations, see the *ESCON and FICON Channel-to-Channel Reference*, SB10-7034.

Note: All shared CTC examples within a single CPC exclude an LP from communicating with itself. This exclusion is required for some subsystems (for example, XCF). Other subsystems may not have this restriction and may support an LP communicating with itself.



LP1A to LP2A: 50 to 51 (6 CTCs)
52 to 53 (6 CTCs)
LP1A to LP3A: 50 to 51 (6 CTCs)
52 to 53 (6 CTCs)
LP1A to LP4A: 50 to 51 (6 CTCs)
52 to 53 (6 CTCs)
LP2A to LP3A: 50 to 51 (6 CTCs)
52 to 53 (6 CTCs)
LP2A to LP4A: 50 to 51 (6 CTCs)
52 to 53 (6 CTCs)
LP3A to LP4A: 50 to 51 (6 CTCs)
52 to 53 (6 CTCs)

LP5B to LP6B: 60 to 61 (6 CTCs)
62 to 63 (6 CTCs)
LP5B to LP7B: 60 to 61 (6 CTCs)
62 to 63 (6 CTCs)
LP6B to LP7B: 60 to 61 (6 CTCs)
62 to 63 (6 CTCs)

LP1A to LP5B: 50 to 61 (6 CTCs)
52 to 63 (6 CTCs)
LP2A to LP5B: 50 to 61 (6 CTCs)
52 to 63 (6 CTCs)
LP3A to LP5B: 51 to 60 (6 CTCs)
53 to 62 (6 CTCs)
LP4A to LP5B: 51 to 60 (6 CTCs)
53 to 62 (6 CTCs)

LP1A to LP6B: 50 to 61 (6 CTCs)
52 to 63 (6 CTCs)
LP2A to LP6B: 50 to 61 (6 CTCs)
52 to 63 (6 CTCs)
LP3A to LP6B: 51 to 60 (6 CTCs)
53 to 62 (6 CTCs)
LP4A to LP6B: 51 to 60 (6 CTCs)
53 to 62 (6 CTCs)

LP1A to LP7B: 50 to 61 (6 CTCs)
52 to 63 (6 CTCs)
LP2A to LP7B: 50 to 61 (6 CTCs)
52 to 63 (6 CTCs)
LP3A to LP7B: 51 to 60 (6 CTCs)
53 to 62 (6 CTCs)
LP4A to LP7B: 51 to 60 (6 CTCs)
53 to 62 (6 CTCs)

Figure E-17. ESCON CTC with Shared Channels

IOCP Input for System A (Shared)

```
RESOURCE PARTITION=((LP1A,1),(LP2A,2),(LP3A,3),(LP4A,4))

CHPID PATH=50,TYPE=CNC,SWITCH=01,SHARED,...
CHPID PATH=51,TYPE=CTC,SWITCH=01,SHARED,...
CHPID PATH=52,TYPE=CNC,SWITCH=02,SHARED,...
CHPID PATH=53,TYPE=CTC,SWITCH=02,SHARED,...

************************************************
* First any-to-any CTC connections with Switch=01 *
************************************************
*
*********************************************************************
* CTC wrap-around connections among LP1A, LP2A, LP3A, and LP4A
```

```
* Via CHPID 50 (CNC) in System A to CHPID 51 (CTC) in System A
*
* Define a control unit representing each partition sharing
* destination channel CHPID 51 (CTC) to source channel CHPID 50 (CNC).
*
* Representing LP1A:
 CNTLUNIT CUNUMBR=5010,PATH=50,LINK=C1,CUADD=1,UNITADD=((40,6)),UNIT=SCTC
* LP1A is excluded using NOTPART keyword to disallow LP1A to LP1A CTC
 IODEVICE ADDRESS=(5010,6),CUNUMBR=5010,UNITADD=40,NOTPART=(LP1A),UNIT=SCTC
*
* Representing LP2A:
 CNTLUNIT CUNUMBR=5020,PATH=50,LINK=C1,CUADD=2,UNITADD=((40,6)),UNIT=SCTC
* LP2A is excluded using NOTPART keyword to disallow LP2A to LP2A CTC
 IODEVICE ADDRESS=(5020,6),CUNUMBR=5020,UNITADD=40,NOTPART=(LP2A),UNIT=SCTC
*
* Representing LP3A:
 CNTLUNIT CUNUMBR=5030,PATH=50,LINK=C1,CUADD=3,UNITADD=((40,6)),UNIT=SCTC
* LP3A is excluded using NOTPART keyword to disallow LP3A to LP3A CTC
 IODEVICE ADDRESS=(5030,6),CUNUMBR=5030,UNITADD=40,NOTPART=(LP3A),UNIT=SCTC
*
* Representing LP4A:
 CNTLUNIT CUNUMBR=5040,PATH=50,LINK=C1,CUADD=4,UNITADD=((40,6)),UNIT=SCTC
* LP4A is excluded using NOTPART keyword to disallow LP4A to LP4A CTC
 IODEVICE ADDRESS=(5040,6),CUNUMBR=5040,UNITADD=40,NOTPART=(LP4A),UNIT=SCTC
*
* Define a control unit representing each partition sharing
* destination channel CHPID 50 (CNC) to source channel CHPID 51 (CTC).
* Representing LP1A:
 CNTLUNIT CUNUMBR=5110,PATH=51,LINK=C0,CUADD=1,UNITADD=((40,6)),UNIT=SCTC
 IODEVICE ADDRESS=(5110,6),CUNUMBR=5110,UNITADD=40,NOTPART=(LP1A),UNIT=SCTC
*
* Representing LP2A:
 CNTLUNIT CUNUMBR=5120,PATH=51,LINK=C0,CUADD=2,UNITADD=((40,6)),UNIT=SCTC
 IODEVICE ADDRESS=(5120,6),CUNUMBR=5120,UNITADD=40,NOTPART=(LP2A),UNIT=SCTC
*
* Representing LP3A:
 CNTLUNIT CUNUMBR=5130,PATH=51,LINK=C0,CUADD=3,UNITADD=((40,6)),UNIT=SCTC
 IODEVICE ADDRESS=(5130,6),CUNUMBR=5130,UNITADD=40,NOTPART=(LP3A),UNIT=SCTC
*
* Representing LP4A:
 CNTLUNIT CUNUMBR=5140,PATH=51,LINK=C0,CUADD=4,UNITADD=((40,6)),UNIT=SCTC
 IODEVICE ADDRESS=(5140,6),CUNUMBR=5140,UNITADD=40,NOTPART=(LP4A),UNIT=SCTC
**********************************************************************
* CTC connections between (LP1A,LP2A) and (LP5B,LP6B,LP7B)
*
* Define a control unit representing each partition sharing
* destination channel CHPID 61 (CTC) to source channel CHPID 50 (CNC).
* Only LP1A and LP2A use 50-61 CTC connection for workload balance
* Representing LP5B:
 CNTLUNIT CUNUMBR=5050,PATH=50,LINK=D1,CUADD=5,UNITADD=((40,6)),UNIT=SCTC
 IODEVICE   ADDRESS=(5050,6),CUNUMBR=5050,UNITADD=40,PART=(LP1A,LP2A),UNIT=SCTC
*
* Representing LP6B:
 CNTLUNIT CUNUMBR=5060,PATH=50,LINK=D1,CUADD=6,UNITADD=((40,6)),UNIT=SCTC
 IODEVICE  ADDRESS=(5060,6),CUNUMBR=5060,UNITADD=40,PART=(LP1A,LP2A),UNIT=SCTC
*
* Representing LP7B:
 CNTLUNIT CUNUMBR=5070,PATH=50,LINK=D1,CUADD=7,UNITADD=((40,6)),UNIT=SCTC
 IODEVICE  ADDRESS=(5070,6),CUNUMBR=5070,UNITADD=40,PART=(LP1A,LP2A),UNIT=SCTC
**********************************************************************
* CTC connections between (LP3A,LP4A) and (LP5B,LP6B,LP7B)
*
* Define a control unit representing each partition sharing
* destination channel CHPID 60 (CNC) to source channel CHPID 51 (CTC).
* Only LP3A and LP4A use 51-60 CTC connection for workload balance
* Representing LP5B:
 CNTLUNIT CUNUMBR=5150,PATH=51,LINK=D0,CUADD=5,UNITADD=((40,6)),UNIT=SCTC
```

```
 IODEVICE  ADDRESS=(5150,6),CUNUMBR=5150,UNITADD=40,PART=(LP3A,LP4A),UNIT=SCTC
*
* Representing LP6B:
 CNTLUNIT CUNUMBR=5160,PATH=51,LINK=D0,CUADD=6,UNITADD=((40,6)),UNIT=SCTC
 IODEVICE  ADDRESS=(5160,6),CUNUMBR=5160,UNITADD=40,PART=(LP3A,LP4A),UNIT=SCTC
*
* Representing LP7B:
 CNTLUNIT CUNUMBR=5170,PATH=51,LINK=D0,CUADD=7,UNITADD=((40,6)),UNIT=SCTC
 IODEVICE  ADDRESS=(5170,6),CUNUMBR=5170,UNITADD=40,PART=(LP3A,LP4A),UNIT=SCTC

************************************************
* Second any-to-any CTC connections with Switch=02 *
************************************************
*
*********************************************************************
* CTC wrap-around connections among LP1A, LP2A, LP3A, and LP4A
* Via CHPID 52 (CNC) in System A to CHPID 53 (CTC) in System A
*
* Define a control unit representing each partition sharing
* destination channel CHPID 53 (CTC) to source channel CHPID 52 (CNC).
*
* Representing LP1A:
 CNTLUNIT CUNUMBR=5210,PATH=52,LINK=C3,CUADD=1,UNITADD=((40,6)),UNIT=SCTC
* LP1A is excluded using NOTPART keyword to disallow LP1A to LP1A CTC
 IODEVICE ADDRESS=(5210,6),CUNUMBR=5210,UNITADD=40,NOTPART=(LP1A),UNIT=SCTC
*
* Representing LP2A:
 CNTLUNIT CUNUMBR=5220,PATH=52,LINK=C3,CUADD=2,UNITADD=((40,6)),UNIT=SCTC
* LP2A is excluded using NOTPART keyword to disallow LP2A to LP2A CTC
 IODEVICE ADDRESS=(5220,6),CUNUMBR=5220,UNITADD=40,NOTPART=(LP2A),UNIT=SCTC
*
* Representing LP3A:
 CNTLUNIT CUNUMBR=5230,PATH=52,LINK=C3,CUADD=3,UNITADD=((40,6)),UNIT=SCTC
* LP3A is excluded using NOTPART keyword to disallow LP3A to LP3A CTC
 IODEVICE ADDRESS=(5230,6),CUNUMBR=5230,UNITADD=40,NOTPART=(LP3A),UNIT=SCTC
*
* Representing LP4A:
 CNTLUNIT CUNUMBR=5240,PATH=52,LINK=C3,CUADD=4,UNITADD=((40,6)),UNIT=SCTC
* LP4A is excluded using NOTPART keyword to disallow LP4A to LP4A CTC
 IODEVICE ADDRESS=(5240,6),CUNUMBR=5240,UNITADD=40,NOTPART=(LP4A),UNIT=SCTC
*
* Define a control unit representing each partition sharing
* destination channel CHPID 52 (CNC) to source channel CHPID 53 (CTC).
* Representing LP1A:
 CNTLUNIT CUNUMBR=5310,PATH=53,LINK=C2,CUADD=1,UNITADD=((40,6)),UNIT=SCTC
 IODEVICE ADDRESS=(5310,6),CUNUMBR=5310,UNITADD=40,NOTPART=(LP1A),UNIT=SCTC
*
* Representing LP2A:
 CNTLUNIT CUNUMBR=5320,PATH=53,LINK=C2,CUADD=2,UNITADD=((40,6)),UNIT=SCTC
 IODEVICE ADDRESS=(5320,6),CUNUMBR=5320,UNITADD=40,NOTPART=(LP2A),UNIT=SCTC
*
* Representing LP3A:
 CNTLUNIT CUNUMBR=5330,PATH=53,LINK=C2,CUADD=3,UNITADD=((40,6)),UNIT=SCTC
 IODEVICE ADDRESS=(5330,6),CUNUMBR=5330,UNITADD=40,NOTPART=(LP3A),UNIT=SCTC
*
* Representing LP4A:
 CNTLUNIT CUNUMBR=5340,PATH=53,LINK=C2,CUADD=4,UNITADD=((40,6)),UNIT=SCTC
 IODEVICE ADDRESS=(5340,6),CUNUMBR=5340,UNITADD=40,NOTPART=(LP4A),UNIT=SCTC
*********************************************************************
* CTC connections between (LP1A,LP2A) and (LP5B,LP6B,LP7B)
*
* Define a control unit representing each partition sharing
* destination channel CHPID 63 (CTC) to source channel CHPID 52 (CNC).
* Only LP1A and LP2A use 52-63 CTC connections for workload balance
* Representing LP5B:
 CNTLUNIT CUNUMBR=5250,PATH=52,LINK=D3,CUADD=5,UNITADD=((40,6)),UNIT=SCTC
 IODEVICE  ADDRESS=(5250,6),CUNUMBR=5250,UNITADD=40,PART=(LP1A,LP2A),UNIT=SCTC
```

```
*
* Representing LP6B:
 CNTLUNIT CUNUMBR=5260,PATH=52,LINK=D3,CUADD=6,UNITADD=((40,6)),UNIT=SCTC
 IODEVICE  ADDRESS=(5260,6),CUNUMBR=5260,UNITADD=40,PART=(LP1A,LP2A),UNIT=SCTC
*
* Representing LP7B:
 CNTLUNIT CUNUMBR=5270,PATH=52,LINK=D3,CUADD=7,UNITADD=((40,6)),UNIT=SCTC
 IODEVICE  ADDRESS=(5270,6),CUNUMBR=5270,UNITADD=40,PART=(LP1A,LP2A),UNIT=SCTC
*********************************************************************
* CTC connections between (LP3A,LP4A) and (LP5B,LP6B,LP7B)
*
* Define a control unit representing destination channel CHPID 62 (CNC)
* to source channel CHPID 53 (CTC).
* Only LP3A and LP4A use 53-62 CTC connections for workload balance
* Representing LP5B:
 CNTLUNIT CUNUMBR=5350,PATH=53,LINK=D2,CUADD=5,UNITADD=((40,6)),UNIT=SCTC
 IODEVICE  ADDRESS=(5350,6),CUNUMBR=5350,UNITADD=40,PART=(LP3A,LP4A),UNIT=SCTC
* Representing LP6B:
 CNTLUNIT CUNUMBR=5360,PATH=53,LINK=D2,CUADD=6,UNITADD=((40,6)),UNIT=SCTC
 IODEVICE  ADDRESS=(5360,6),CUNUMBR=5360,UNITADD=40,PART=(LP3A,LP4A),UNIT=SCTC
* Representing LP7B:
 CNTLUNIT CUNUMBR=5370,PATH=53,LINK=D2,CUADD=7,UNITADD=((40,6)),UNIT=SCTC
 IODEVICE  ADDRESS=(5370,6),CUNUMBR=5370,UNITADD=40,PART=(LP3A,LP4A),UNIT=SCTC
```

IOCP Input for System B (Unshared)

```
 RESOURCE PARTITION=((LP5B,5),(LP6B,6),(LP7B,7))

 CHPID PATH=60,TYPE=CNC,SWITCH=01,SHARED,...
 CHPID PATH=61,TYPE=CTC,SWITCH=01,SHARED,...
 CHPID PATH=62,TYPE=CNC,SWITCH=02,SHARED,...
 CHPID PATH=63,TYPE=CTC,SWITCH=02,SHARED,...

************************************************
* First any-to-any CTC connections with Switch=01 *
************************************************
*
************************************************************
* CTC wrap-around connections among LP5B, LP6B, LP7B
* Via CHPID 60 (CNC) in System B to CHPID 61 (CTC) in System B
*
* Define a control unit representing each partition sharing
* destination channel CHPID 61 (CTC) to source channel CHPID 60 (CNC).
*
* Representing LP5B:
 CNTLUNIT CUNUMBR=6050,PATH=60,LINK=D1,CUADD=5,UNITADD=((40,6)),UNIT=SCTC
* LP5B is excluded using NOTPART keyword to disallow LP5B to LP5B CTC
 IODEVICE ADDRESS=(6050,6),CUNUMBR=6050,UNITADD=40,NOTPART=(LP5B),UNIT=SCTC
*
* Representing LP6B:
 CNTLUNIT CUNUMBR=6060,PATH=60,LINK=D1,CUADD=6,UNITADD=((40,6)),UNIT=SCTC
* LP6B is excluded using NOTPART keyword to disallow LP6B to LP6B CTC
 IODEVICE ADDRESS=(6060,6),CUNUMBR=6060,UNITADD=40,NOTPART=(LP6B),UNIT=SCTC
*
* Representing LP7B:
 CNTLUNIT CUNUMBR=6070,PATH=60,LINK=D1,CUADD=7,UNITADD=((40,6)),UNIT=SCTC
* LP7B is excluded using NOTPART keyword to disallow LP7B to LP7B CTC
 IODEVICE ADDRESS=(6070,6),CUNUMBR=6070,UNITADD=40,NOTPART=(LP7B),UNIT=SCTC
*
*
* Define a control unit representing each partition sharing
* destination channel CHPID 60 (CNC) to source channel CHPID 61 (CTC).
* Representing LP5B:
 CNTLUNIT CUNUMBR=6150,PATH=61,LINK=D0,CUADD=5,UNITADD=((40,6)),UNIT=SCTC
* LP5B is excluded using NOTPART keyword to disallow LP5B to LP5B CTC
 IODEVICE ADDRESS=(6150,6),CUNUMBR=6150,UNITADD=40,NOTPART=(LP5B),UNIT=SCTC
*
```

```
* Representing LP6B:
 CNTLUNIT CUNUMBR=6160,PATH=61,LINK=D0,CUADD=6,UNITADD=((40,6)),UNIT=SCTC
* LP6B is excluded using NOTPART keyword to disallow LP6B to LP6B CTC
 IODEVICE ADDRESS=(6160,6),CUNUMBR=6160,UNITADD=40,NOTPART=(LP6B),UNIT=SCTC
*
* Representing LP7B:
 CNTLUNIT CUNUMBR=6170,PATH=61,LINK=D0,CUADD=7,UNITADD=((40,6)),UNIT=SCTC
* LP7B is excluded using NOTPART keyword to disallow LP7B to LP7B CTC
 IODEVICE ADDRESS=(6170,6),CUNUMBR=6170,UNITADD=40,NOTPART=(LP7B),UNIT=SCTC
**********************************************************************
* CTC connections between (LP5B,LP6B,LP7B) and (LP1A,LP2A)
* Via CHPID 61 (CTC) in System B to CHPID 50 (CNC) in System A
*
* Define a control unit representing each partition sharing
* destination channel CHPID 50 (CNC) to source channel CHPID 61 (CTC).
* Representing LP1A:
 CNTLUNIT CUNUMBR=6110,PATH=61,LINK=C0,CUADD=1,UNITADD=((40,6)),UNIT=SCTC
 IODEVICE ADDRESS=(6110,6),CUNUMBR=6110,UNITADD=40,UNIT=SCTC
*
* Representing LP2A:
 CNTLUNIT CUNUMBR=6120,PATH=61,LINK=C0,CUADD=2,UNITADD=((40,6),UNIT=SCTC
 IODEVICE ADDRESS=(6120,6),CUNUMBR=6120,UNITADD=40,UNIT=SCTC
**********************************************************************
* CTC connections between (LP5B,LP6B,LP7B) and (LP3A,LP4A)
* Via CHPID 60 (CNC) in System B to CHPID 51 (CTC) in System A
*
* Define a control unit representing each partition sharing
* destination channel CHPID 51 (CTC) to source channel CHPID 60 (CNC).
* Representing LP3A:
 CNTLUNIT CUNUMBR=6030,PATH=60,LINK=C1,CUADD=3,UNITADD=((40,6)),UNIT=SCTC
 IODEVICE ADDRESS=(6030,6),CUNUMBR=6030,UNITADD=40,UNIT=SCTC
*
* Representing LP4A:
 CNTLUNIT CUNUMBR=6040,PATH=60,LINK=C1,CUADD=4,UNITADD=((40,6),UNIT=SCTC
 IODEVICE ADDRESS=(6040,6),CUNUMBR=6040,UNITADD=40,UNIT=SCTC

**************************************************
* Second any-to-any CTC connections with Switch=02 *
**************************************************
*
************************************************************
* CTC wrap-around connections among LP5B, LP6B, LP7B
* Via CHPID 62 (CNC) in System B to CHPID 63 (CTC) in System B
*
* Define a control unit representing each partition sharing
* destination channel CHPID 63 (CTC) to source channel CHPID 62 (CNC).
*
* Representing LP5B:
 CNTLUNIT CUNUMBR=6250,PATH=62,LINK=D3,CUADD=5,UNITADD=((40,6)),UNIT=SCTC
* LP5B is excluded using NOTPART keyword to disallow LP5B to LP5B CTC
 IODEVICE ADDRESS=(6250,6),CUNUMBR=6210,UNITADD=40,NOTPART=(LP5B),UNIT=SCTC
*
* Representing LP6B:
 CNTLUNIT CUNUMBR=6260,PATH=62,LINK=D3,CUADD=6,UNITADD=((40,6)),UNIT=SCTC
* LP6B is excluded using NOTPART keyword to disallow LP6B to LP6B CTC
 IODEVICE ADDRESS=(6260,6),CUNUMBR=6260,UNITADD=40,NOTPART=(LP6B),UNIT=SCTC
*
* Representing LP7B:
 CNTLUNIT CUNUMBR=6270,PATH=62,LINK=D3,CUADD=7,UNITADD=((40,6)),UNIT=SCTC
* LP7B is excluded using NOTPART keyword to disallow LP7B to LP7B CTC
 IODEVICE ADDRESS=(6270,6),CUNUMBR=6270,UNITADD=40,NOTPART=(LP7B),UNIT=SCTC
*
* Define a control unit representing each partition sharing
* destination channel CHPID 62 (CNC) to source channel CHPID 63 (CTC).
* Representing LP5B:
 CNTLUNIT CUNUMBR=6350,PATH=63,LINK=D2,CUADD=5,UNITADD=((40,6)),UNIT=SCTC
* LP5B is excluded using NOTPART keyword to disallow LP5B to LP5B CTC
```

```
 IODEVICE ADDRESS=(6350,6),CUNUMBR=6350,UNITADD=40,NOTPART=(LP5B),UNIT=SCTC
*
* Representing LP6B:
 CNTLUNIT CUNUMBR=6360,PATH=63,LINK=D2,CUADD=6,UNITADD=((40,6)),UNIT=SCTC
* LP6B is excluded using NOTPART keyword to disallow LP6B to LP6B CTC
 IODEVICE ADDRESS=(6360,6),CUNUMBR=6360,UNITADD=40,NOTPART=(LP6B),UNIT=SCTC
*
* Representing LP7B:
 CNTLUNIT CUNUMBR=6370,PATH=63,LINK=D2,CUADD=7,UNITADD=((40,6)),UNIT=SCTC
* LP7B is excluded using NOTPART keyword to disallow LP7B to LP7B CTC
 IODEVICE ADDRESS=(6370,6),CUNUMBR=6370,UNITADD=40,NOTPART=(LP7B),UNIT=SCTC
**********************************************************************
* CTC connections between (LP5B,LP6B,LP7B) and (LP1A,LP2A)
* Via CHPID 63 (CTC) in System B to CHPID 52 (CNC) in System A
*
* Define a control unit representing each partition sharing
* destination channel CHPID 52 (CNC) to source channel CHPID 63 (CTC).
* Representing LP1A:
 CNTLUNIT CUNUMBR=6310,PATH=63,LINK=C2,CUADD=1,UNITADD=((40,6)),UNIT=SCTC
 IODEVICE ADDRESS=(6310,6),CUNUMBR=6310,UNITADD=40,UNIT=SCTC
*
* Representing LP2A:
 CNTLUNIT CUNUMBR=6320,PATH=63,LINK=C2,CUADD=2,UNITADD=((40,6),UNIT=SCTC
 IODEVICE ADDRESS=(6320,6),CUNUMBR=6320,UNITADD=40,UNIT=SCTC
**********************************************************************
* CTC connections between (LP5B,LP6B,LP7B) and (LP3A,LP4A)
* Via CHPID 62 (CNC) in System B to CHPID 53 (CTC) in System A
*
* Define a control unit representing each partition sharing
* destination channel CHPID 53 (CTC) to source channel CHPID 62 (CNC).
* Representing LP3A:
 CNTLUNIT CUNUMBR=6230,PATH=62,LINK=C3,CUADD=3,UNITADD=((40,6)),UNIT=SCTC
 IODEVICE ADDRESS=(6230,6),CUNUMBR=6230,UNITADD=40,UNIT=SCTC
*
* Representing LP4A:
 CNTLUNIT CUNUMBR=6240,PATH=62,LINK=C3,CUADD=4,UNITADD=((40,6),UNIT=SCTC
 IODEVICE ADDRESS=(6240,6),CUNUMBR=6240,UNITADD=40,UNIT=SCTC
```

FICON CTC with Shared Channels

A fully redundant any-to-any CTC configuration consists of two sets of CTC minimum configurations, each associated with a separate FICON Director. CTC communication is configured such that the definitions operate in half duplex on the FICON channels. See Figure E-18. For recommendations for numbering CTC control units and devices to simplify CTC configurations, see the *ESCON and FICON Channel-to-Channel Reference*, SB10-7034.

Note: All shared CTC examples within a single CPC exclude an LP from communicating with itself. This exclusion is required for some subsystems (for example, XCF). Other subsystems may not have this restriction and may support an LP communicating with itself.

This example uses a simple CTC configuration approach where the same channel path is always used for sending or receiving data and the same destination link address for a control unit number is always used. For example, System A always uses CHPID 50 on switch 01 for sending data and always uses CHPID 51 on switch 01 for receiving data. Also, all CPCs always use FCTC control unit 4010 to send data to LP1A on System A via link address C1 (CHPID 51) on System A. So a single destination link address (C1) is always associated with the same control unit number (4010).

This approach results in the FICON channels having half duplex definitions. That is, all FCTC I/O data flow is on one fibre of the FICON channel resulting in its being half duplex. To balance I/O data flow on the FICON channel in this case, put tape devices on the channels used for receive FCTC control units and put DASD devices on the channels used for send FCTC control units. For example, you would put tape devices on CHPID 51 in System A and DASD devices on CHPID 50 in System A.

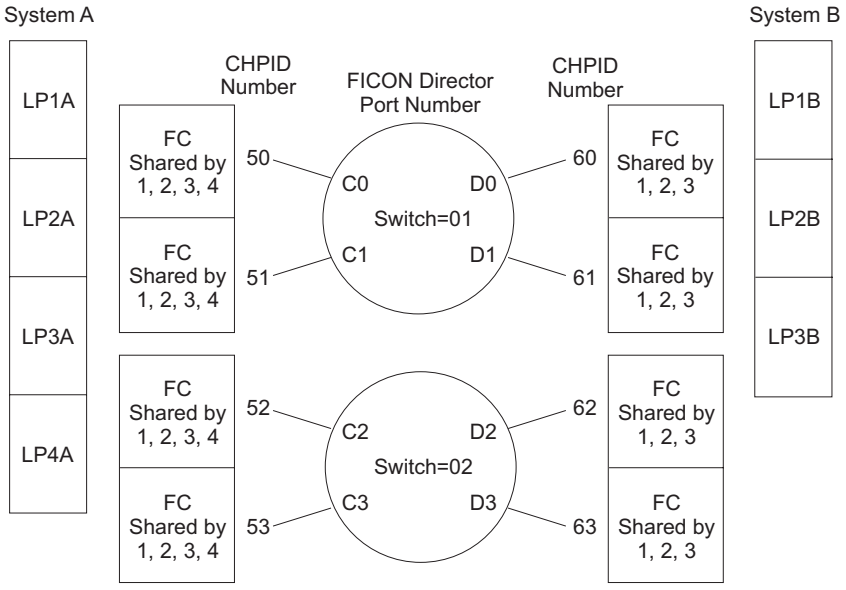


Figure E-18. FICON CTC (Fully Redundant)

Every logical partition has eight primary and eight secondary CTC connections with every other logical partition. The primary connections use switch 01 and the secondary connections use switch 02.

IOCP Statements for System A

```
 RESOURCE PART=((LP1A,1),(LP2A,2),(LP3A,3),(LP4A,4))
*
 CHPID PATH=50,TYPE=FC,SWITCH=01,SHARED,...
 CHPID PATH=51,TYPE=FC,SWITCH=01,SHARED,...
 CHPID PATH=52,TYPE=FC,SWITCH=02,SHARED,...
 CHPID PATH=53,TYPE=FC,SWITCH=02,SHARED,...
*
****************************************************
* Primary any-to-any CTC connections with Switch=01 *
****************************************************
*
*********************************************************************
* Primary wrap-around connections for logical partitions on System A *
*********************************************************************
*
* Send FCTC Control Unit and Device Definitions to CTC image ID 01
*
 CNTLUNIT CUNUMBR=4010,PATH=50,LINK=C1,CUADD=1,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(4010,8),CUNUMBR=4010,UNIT=FCTC,UNITADD=00,         +
               NOTPART=LP1A
*
* Send FCTC Control Unit and Device Definitions to CTC image ID 02
*
 CNTLUNIT CUNUMBR=4020,PATH=50,LINK=C1,CUADD=2,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(4020,8),CUNUMBR=4020,UNIT=FCTC,UNITADD=00,         +
               NOTPART=LP2A
*
* Send FCTC Control Unit and Device Definitions to CTC image ID 03
*
 CNTLUNIT CUNUMBR=4030,PATH=50,LINK=C1,CUADD=3,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(4030,8),CUNUMBR=4030,UNIT=FCTC,UNITADD=00,         +
               NOTPART=LP3A
*
* Send FCTC Control Unit and Device Definitions to CTC image ID 04
*
 CNTLUNIT CUNUMBR=4040,PATH=50,LINK=C1,CUADD=4,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(4040,8),CUNUMBR=4040,UNIT=FCTC,UNITADD=00,         +
               NOTPART=LP4A
*
* Receive FCTC CU and Device Definitions from CTC image ID 01
*
 CNTLUNIT CUNUMBR=5010,PATH=51,LINK=C0,CUADD=1,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(5010,8),CUNUMBR=5010,UNIT=FCTC,UNITADD=00,         +
               NOTPART=LP1A
*
* Receive FCTC CU and Device Definitions from CTC image ID 02
*
 CNTLUNIT CUNUMBR=5020,PATH=51,LINK=C0,CUADD=2,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(5020,8),CUNUMBR=5020,UNIT=FCTC,UNITADD=00,         +
               NOTPART=LP2A
*
* Receive FCTC CU and Device Definitions from CTC image ID 03
*
 CNTLUNIT CUNUMBR=5030,PATH=51,LINK=C0,CUADD=3,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(5030,8),CUNUMBR=5030,UNIT=FCTC,UNITADD=00,         +
               NOTPART=LP3A
*
* Receive FCTC CU and Device Definitions from CTC image ID 04
```

```
*
 CNTLUNIT CUNUMBR=5040,PATH=51,LINK=C0,CUADD=4,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(5040,8),CUNUMBR=5040,UNIT=FCTC,UNITADD=00,         +
               NOTPART=LP4A
**********************************************************************
* Primary CTC connections on Switch=01 to System B.                  *
**********************************************************************
*
* Send FCTC Control Unit and Device Definitions to CTC image ID 21
*
 CNTLUNIT CUNUMBR=4210,PATH=50,LINK=D1,CUADD=1,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(4210,8),CUNUMBR=4210,UNIT=FCTC,UNITADD=00
*
* Send FCTC Control Unit and Device Definitions to CTC image ID 22
*
 CNTLUNIT CUNUMBR=4220,PATH=50,LINK=D1,CUADD=2,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(4220,8),CUNUMBR=4220,UNIT=FCTC,UNITADD=00
*
* Send FCTC Control Unit and Device Definitions to CTC image ID 23
*
 CNTLUNIT CUNUMBR=4230,PATH=50,LINK=D1,CUADD=3,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(4230,8),CUNUMBR=4230,UNIT=FCTC,UNITADD=00
*
* Receive FCTC CU and Device Definitions from CTC image ID 21
*
 CNTLUNIT CUNUMBR=5210,PATH=51,LINK=D0,CUADD=1,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(5210,8),CUNUMBR=5210,UNIT=FCTC,UNITADD=00
*
* Receive FCTC CU and Device Definitions from CTC image ID 22
*
 CNTLUNIT CUNUMBR=5220,PATH=51,LINK=D0,CUADD=2,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(5220,8),CUNUMBR=5220,UNIT=FCTC,UNITADD=00
*
* Receive FCTC CU and Device Definitions from CTC image ID 23
*
 CNTLUNIT CUNUMBR=5230,PATH=51,LINK=D0,CUADD=3,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(5230,8),CUNUMBR=5230,UNIT=FCTC,UNITADD=00
*
******************************************************
* Secondary any-to-any CTC connections with Switch=02 *
******************************************************
*
******************************************************
* Secondary wrap-around connections for LPs on System A *
******************************************************
*
* Send FCTC Control Unit and Device Definitions to CTC image ID 01
*
 CNTLUNIT CUNUMBR=4018,PATH=52,LINK=C3,CUADD=1,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(4018,8),CUNUMBR=4018,UNIT=FCTC,UNITADD=00,         +
               NOTPART=LP1A
*
* Send FCTC Control Unit and Device Definitions to CTC image ID 02
*
 CNTLUNIT CUNUMBR=4028,PATH=52,LINK=C3,CUADD=2,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(4028,8),CUNUMBR=4028,UNIT=FCTC,UNITADD=00,         +
               NOTPART=LP2A
*
```

```
* Send FCTC Control Unit and Device Definitions to CTC image ID 03
*
 CNTLUNIT CUNUMBR=4038,PATH=52,LINK=C3,CUADD=3,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(4038,8),CUNUMBR=4038,UNIT=FCTC,UNITADD=00,         +
               NOTPART=LP3A
*
* Send FCTC Control Unit and Device Definitions to CTC image ID 04
*
 CNTLUNIT CUNUMBR=4048,PATH=52,LINK=C3,CUADD=4,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(4048,8),CUNUMBR=4048,UNIT=FCTC,UNITADD=00,         +
               NOTPART=LP4A
*
* Receive FCTC CU and Device Definitions from CTC image ID 01
*
 CNTLUNIT CUNUMBR=5018,PATH=53,LINK=C2,CUADD=1,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(5018,8),CUNUMBR=5018,UNIT=FCTC,UNITADD=00,         +
               NOTPART=LP1A
*
* Receive FCTC CU and Device Definitions from CTC image ID 02
*
 CNTLUNIT CUNUMBR=5028,PATH=53,LINK=C2,CUADD=2,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(5028,8),CUNUMBR=5028,UNIT=FCTC,UNITADD=00,         +
               NOTPART=LP2A
*
* Receive FCTC CU and Device Definitions from CTC image ID 03
*
 CNTLUNIT CUNUMBR=5038,PATH=53,LINK=C2,CUADD=3,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(5038,8),CUNUMBR=5038,UNIT=FCTC,UNITADD=00,         +
               NOTPART=LP3A
*
* Receive FCTC CU and Device Definitions from CTC image ID 04
*
 CNTLUNIT CUNUMBR=5048,PATH=53,LINK=C2,CUADD=4,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(5048,8),CUNUMBR=5048,UNIT=FCTC,UNITADD=00,         +
               NOTPART=LP4A
**********************************************************************
* Secondary CTC connections on Switch=02 to System B.                *
**********************************************************************
*
* Send FCTC Control Unit and Device Definitions to CTC image ID 21
*
 CNTLUNIT CUNUMBR=4218,PATH=52,LINK=D3,CUADD=1,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(4218,8),CUNUMBR=4218,UNIT=FCTC,UNITADD=00
*
* Send FCTC Control Unit and Device Definitions to CTC image ID 22
*
 CNTLUNIT CUNUMBR=4228,PATH=52,LINK=D3,CUADD=2,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(4228,8),CUNUMBR=4228,UNIT=FCTC,UNITADD=00
*
* Send FCTC Control Unit and Device Definitions to CTC image ID 23
*
 CNTLUNIT CUNUMBR=4238,PATH=52,LINK=D3,CUADD=3,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(4238,8),CUNUMBR=4238,UNIT=FCTC,UNITADD=00
*
* Receive FCTC CU and Device Definitions from CTC image ID 21
*
 CNTLUNIT CUNUMBR=5218,PATH=53,LINK=D2,CUADD=1,UNITADD=((00,8)),      +
               UNIT=FCTC
```

```
 IODEVICE ADDRESS=(5218,8),CUNUMBR=5218,UNIT=FCTC,UNITADD=00
*
* Receive FCTC CU and Device Definitions from CTC image ID 22
*
 CNTLUNIT CUNUMBR=5228,PATH=53,LINK=D2,CUADD=2,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(5228,8),CUNUMBR=5228,UNIT=FCTC,UNITADD=00
*
* Receive FCTC CU and Device Definitions from CTC image ID 23
*
 CNTLUNIT CUNUMBR=5238,PATH=53,LINK=D2,CUADD=3,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(5238,8),CUNUMBR=5238,UNIT=FCTC,UNITADD=00
```

IOCP Statements for System B

```
 RESOURCE PART=((LP1B,1),(LP2B,2),(LP3B,3))
*
 CHPID PATH=60,TYPE=FC,SWITCH=01,SHARED,...
 CHPID PATH=61,TYPE=FC,SWITCH=01,SHARED,...
 CHPID PATH=62,TYPE=FC,SWITCH=02,SHARED,...
 CHPID PATH=63,TYPE=FC,SWITCH=02,SHARED,...
*
************************************************
* Primary any-to-any CTC connections with Switch=01 *
************************************************
*
*********************************************************************
* Primary wrap-around connections for logical partitions on System B *
*********************************************************************
*
* Send FCTC Control Unit and Device Definitions to CTC image ID 21
*
 CNTLUNIT CUNUMBR=4210,PATH=60,LINK=D1,CUADD=1,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(4210,8),CUNUMBR=4210,UNIT=FCTC,UNITADD=00,         +
               NOTPART=LP1B
*
* Send FCTC Control Unit and Device Definitions to CTC image ID 22
*
 CNTLUNIT CUNUMBR=4220,PATH=60,LINK=D1,CUADD=2,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(4220,8),CUNUMBR=4220,UNIT=FCTC,UNITADD=00,         +
               NOTPART=LP2B
*
* Send FCTC Control Unit and Device Definitions to CTC image ID 23
*
 CNTLUNIT CUNUMBR=4230,PATH=60,LINK=D1,CUADD=3,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(4230,8),CUNUMBR=4230,UNIT=FCTC,UNITADD=00,         +
               NOTPART=LP3B
*
* Receive FCTC CU and Device Definitions from CTC image ID 21
*
 CNTLUNIT CUNUMBR=5210,PATH=61,LINK=D0,CUADD=1,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(5210,8),CUNUMBR=5210,UNIT=FCTC,UNITADD=00,         +
               NOTPART=LP1B
*
* Receive FCTC CU and Device Definitions from CTC image ID 22
*
 CNTLUNIT CUNUMBR=5220,PATH=61,LINK=D0,CUADD=2,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(5220,8),CUNUMBR=5220,UNIT=FCTC,UNITADD=00,         +
               NOTPART=LP2B
*
* Receive FCTC CU and Device Definitions from CTC image ID 23
```

```
*
 CNTLUNIT CUNUMBR=5230,PATH=61,LINK=D0,CUADD=3,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(5230,8),CUNUMBR=5230,UNIT=FCTC,UNITADD=00,         +
               NOTPART=LP3B
**********************************************************************
* Primary CTC connections on Switch=01 to System A.                  *
**********************************************************************
*
* Send FCTC Control Unit and Device Definitions to CTC image ID 01
*
 CNTLUNIT CUNUMBR=4010,PATH=60,LINK=C1,CUADD=1,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(4010,8),CUNUMBR=4010,UNIT=FCTC,UNITADD=00
*
* Send FCTC Control Unit and Device Definitions to CTC image ID 02
*
 CNTLUNIT CUNUMBR=4020,PATH=60,LINK=C1,CUADD=2,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(4020,8),CUNUMBR=4020,UNIT=FCTC,UNITADD=00
*
* Send FCTC Control Unit and Device Definitions to CTC image ID 03
*
 CNTLUNIT CUNUMBR=4030,PATH=60,LINK=C1,CUADD=3,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(4030,8),CUNUMBR=4030,UNIT=FCTC,UNITADD=00
*
* Send FCTC Control Unit and Device Definitions to CTC image ID 04
*
 CNTLUNIT CUNUMBR=4040,PATH=60,LINK=C1,CUADD=4,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(4040,8),CUNUMBR=4040,UNIT=FCTC,UNITADD=00
*
* Receive FCTC CU and Device Definitions from CTC image ID 01
*
 CNTLUNIT CUNUMBR=5010,PATH=61,LINK=C0,CUADD=1,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(5010,8),CUNUMBR=5010,UNIT=FCTC,UNITADD=00
*
* Receive FCTC CU and Device Definitions from CTC image ID 02
*
 CNTLUNIT CUNUMBR=5020,PATH=61,LINK=C0,CUADD=2,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(5020,8),CUNUMBR=5020,UNIT=FCTC,UNITADD=00
*
* Receive FCTC CU and Device Definitions from CTC image ID 03
*
 CNTLUNIT CUNUMBR=5030,PATH=61,LINK=C0,CUADD=3,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(5030,8),CUNUMBR=5030,UNIT=FCTC,UNITADD=00
*
* Receive FCTC CU and Device Definitions from CTC image ID 04
*
 CNTLUNIT CUNUMBR=5040,PATH=61,LINK=C0,CUADD=4,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(5040,8),CUNUMBR=5040,UNIT=FCTC,UNITADD=00
*
******************************************************
* Secondary any-to-any CTC connections with Switch=02 *
******************************************************
*
******************************************************
* Secondary wrap-around connections for LPs on System B *
******************************************************
*
* Send FCTC Control Unit and Device Definitions to CTC image ID 21
*
```

```
 CNTLUNIT CUNUMBR=4218,PATH=62,LINK=D3,CUADD=1,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(4218,8),CUNUMBR=4218,UNIT=FCTC,UNITADD=00,         +
               NOTPART=LP1B
*
* Send FCTC Control Unit and Device Definitions to CTC image ID 22
*
 CNTLUNIT CUNUMBR=4228,PATH=62,LINK=D3,CUADD=2,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(4228,8),CUNUMBR=4228,UNIT=FCTC,UNITADD=00,         +
               NOTPART=LP2B
*
* Send FCTC Control Unit and Device Definitions to CTC image ID 23
*
 CNTLUNIT CUNUMBR=4238,PATH=62,LINK=D3,CUADD=3,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(4238,8),CUNUMBR=4238,UNIT=FCTC,UNITADD=00,         +
               NOTPART=LP3B
*
* Receive FCTC CU and Device Definitions from CTC image ID 21
*
 CNTLUNIT CUNUMBR=5218,PATH=63,LINK=D2,CUADD=1,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(5218,8),CUNUMBR=5218,UNIT=FCTC,UNITADD=00,         +
               NOTPART=LP1B
*
* Receive FCTC CU and Device Definitions from CTC image ID 22
*
 CNTLUNIT CUNUMBR=5228,PATH=63,LINK=D2,CUADD=2,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(5228,8),CUNUMBR=5228,UNIT=FCTC,UNITADD=00,         +
               NOTPART=LP2B
*
* Receive FCTC CU and Device Definitions from CTC image ID 23
*
 CNTLUNIT CUNUMBR=5238,PATH=63,LINK=D2,CUADD=3,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(5238,8),CUNUMBR=5238,UNIT=FCTC,UNITADD=00,         +
               NOTPART=LP3B
**********************************************************************
* Secondary CTC connections on Switch=02 to System A.                *
**********************************************************************
*
* Send FCTC Control Unit and Device Definitions to CTC image ID 01
*
 CNTLUNIT CUNUMBR=4018,PATH=62,LINK=C3,CUADD=1,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(4018,8),CUNUMBR=4018,UNIT=FCTC,UNITADD=00
*
* Send FCTC Control Unit and Device Definitions to CTC image ID 02
*
 CNTLUNIT CUNUMBR=4028,PATH=62,LINK=C3,CUADD=2,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(4028,8),CUNUMBR=4028,UNIT=FCTC,UNITADD=00
*
* Send FCTC Control Unit and Device Definitions to CTC image ID 03
*
 CNTLUNIT CUNUMBR=4038,PATH=62,LINK=C3,CUADD=3,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(4038,8),CUNUMBR=4038,UNIT=FCTC,UNITADD=00
*
* Send FCTC Control Unit and Device Definitions to CTC image ID 04
*
 CNTLUNIT CUNUMBR=4048,PATH=62,LINK=C3,CUADD=4,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(4048,8),CUNUMBR=4048,UNIT=FCTC,UNITADD=00
*
```

```
* Receive FCTC CU and Device Definitions from CTC image ID 01
*
 CNTLUNIT CUNUMBR=5018,PATH=63,LINK=C2,CUADD=1,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(5018,8),CUNUMBR=5018,UNIT=FCTC,UNITADD=00
*
* Receive FCTC CU and Device Definitions from CTC image ID 02
*
 CNTLUNIT CUNUMBR=5028,PATH=63,LINK=C2,CUADD=2,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(5028,8),CUNUMBR=5028,UNIT=FCTC,UNITADD=00
*
* Receive FCTC CU and Device Definitions from CTC image ID 03
*
 CNTLUNIT CUNUMBR=5038,PATH=63,LINK=C2,CUADD=3,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(5038,8),CUNUMBR=5038,UNIT=FCTC,UNITADD=00
*
* Receive FCTC CU and Device Definitions from CTC image ID 04
*
 CNTLUNIT CUNUMBR=5048,PATH=63,LINK=C2,CUADD=4,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(5048,8),CUNUMBR=5048,UNIT=FCTC,UNITADD=00
```

Appendix F. Machine Limits and Rules

Machine Rules. F-2
Machine Limits F-3
Keyword Applicability F-7
CPC Activation and Power-on Reset Error F-8

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Machine Rules

Table F-1 lists the machine rules for the CPCs that IOCP supports.

Table F-1. Machine Rules

Machine Rules	Machine Type (Note 1 on page F-6)		
	2084,1	**2086,1**	**2094,1**
Write IOCDS in preparation for CPC upgrade (CHECKCPC=NO or NOCHKCPC)	Yes	Yes	Yes

To write an IOCDS in preparation for a CPC upgrade, you specify keyword CHECKCPC=NO in the PARM parameter of the EXEC statement (z/OS or VSE) or CMS option NOCHKCPC. To prepare for an upgrade, you can write an IOCDS to any CPC that requires the ICP version of IOCP. See Table F-3 on page F-5 to determine which CPCs require an IOCDS written by ICP IOCP. You can also write an IOCDS when preparing to upgrade from one of the following CPCs to a CPC that requires the ICP version of IOCP:

- 2064 zSeries 900 model CPCs at EC J10638 or later
- 2066 zSeries 800 model CPCs.

The IOCDS cannot be used to power-on reset the z800 or z900 CPC until it is upgraded to the type of CPC the IOCDS supports.

Note: IOCP can write an IOCDS in preparation for an upgrade to a CPC for which IBM does not offer an upgrade. For example, you can write a SYSTEM=(2086,1) IOCDS to a 2084 CPC but no upgrade is offered from a 2084 to a 2086 and the IOCDS will be unusable on the 2084.

Machine Limits

ICP IOCP supports the following limits:

Table F-2. Constant Machine Limits

Machine Limit	
Control Unit Headers (CUHs)	
Maximum channel paths per CUH	8
Physical Control Units (PCUs)	
Maximum PCUs per CVC or CBY channel path (Note 1)	48
Maximum PCUs per CFS, CFP, CBS, CBP, ICP, OSC, OSE, OSN, or FCP channel path	1
Maximum PCUs or link addresses per CNC or CTC channel path	120
Maximum PCUs or link addresses per FCV or FC channel path (Note 5)	256
Maximum PCUs per IQD channel path	64
Maximum PCUs per OSD channel path (Note 7)	16
Maximum UA ranges per CVC or CBY channel path	64
Maximum UA ranges per shared CTC channel path	120
Maximum UA ranges per FC channel path	256
Maximum UAs per CNC channel path	1024
Maximum UAs per CTC channel path	512
Maximum UAs per FCV or FC channel path	16K*
Maximum channel paths per PCU (Note 3)	8
Devices	
Maximum devices per CVC, CBY, CFS, CFP, CBS, CBP, or ICP channel path	256
Maximum devices per CNC channel path	1024
Maximum devices per CTC channel path	512
Maximum devices per OSC channel path (Note 6)	254
Maximum devices per OSE channel path (Note 6)	255
Maximum devices or subchannels per OSD channel path with priority specification enabled	480
Maximum devices or subchannels per OSD channel path with priority specification disabled (CHPARM=02; Note 8)	1920
Maximum UNIT=OSN devices or subchannels per OSN channel path	480
Maximum UNIT=3745 devices or subchannels per OSN channel path	180
Maximum devices or subchannels per FCP channel path	480
Maximum devices per FCV or FC channel path	16K
Maximum devices or subchannels for all IQD channel paths	12K
Maximum channel paths per device (Note 4)	8
Maximum PCUs per device (Note 4)	8
Channel Paths	
Valid chpid range per CSS (Note 2)	00-FF
IOCDS Levels	A0-A3
Logical Partitions	

Table F-2. Constant Machine Limits (continued)

Machine Limit	
Maximum logical partitions per CSS	15
Maximum I/O clusters	64
*K=1024	

Notes:

1. IOCP allows a maximum of 48 to allow you to overgen control units (possibly on a switch) for a path. However, no more than 8 control units on a path should be used at one time.
2. All *chpid* range values are hexadecimal. IOCP allows you to specify the maximum *chpid* range even though your CPC may have only a subset of the channel paths installed.
3. If you define the PCU as an ESCON CTC (UNIT=SCTC) or FICON CTC (UNIT=FCTC) control unit or attach the PCU to an OSC, OSD, OSE, OSN, FCP, or IQD channel path, the PCU can attach to only one channel path per CSS.
4. If the device attaches to a PCU that you defined as an ESCON CTC or FICON CTC control unit or the PCU attaches to an OSC, OSD, OSE, OSN, FCP, or IQD channel path, the device can attach to only one PCU and to one channel path per CSS.

   If the device attaches to a PCU attached to CFS, CFP, CBS, CBP, or ICP channel paths, the device can attach to only one PCU.
5. FCV channel paths can have link addresses in the range 01-FE and, therefore, have a maximum of 254 link addresses.
6. A maximum of 240 OSA valid subchannels can be used on an OSE channel path even though IOCP allows you to define more than this. A maximum of 120 valid subchannels can be used on an OSC channel path even though IOCP allows you to define more than this. See “OSA Configuration Considerations” on page 1-25 for more information.
7. Multiple control units are supported on OSD channel paths on 2084 and 2086 models at EC J13486 (with a LIC patch installed). Otherwise, a maximum of one physical control unit can be defined on an OSD channel path.
8. Disabling priority specification (for example, specifying CHPARM=02 on the CHPID statement) for an OSD channel path is supported on OSD channel paths on 2084 and 2086 models at EC J13486 (with a LIC patch installed). Note that OSA-Express2 features are required when disabling priority specification.

ICP IOCP supports the following limits for the following CPCs (machine types):

Table F-3. Machine Limits

Machine Limit	Machine Type (Note 1)		
	2084,1	**2086,1**	**2094,1**
Devices or Subchannels			
Maximum devices or subchannels per CSS for subchannel set 0	64512 (63K*)	64512 (63K*)	65280 (63.75K*)
Maximum devices or subchannels per CSS for subchannel set 1	N/A	N/A	65535 (64K*-1)
Channel Subsystems (CSSs) and Subchannel Sets			
Maximum CSS ID (Note 6)	3	1	3
Maximum subchannel set ID	0	0	1
Logical Partitions			
Maximum logical partitions (Note 2)	30	30	60
Control Unit Headers (CUHs)			
Maximum CUHs per CSS	4096	4096	4096
Physical Control Units (PCUs)			
Maximum PCUs	8192	8192	8192
Channel Paths			
Maximum PCHID number	6FF	2FF	6FF
Maximum channel paths	1024	512	1024
Maximum CVC, CBY, CNC, or CTC channel paths	1024	420	1024
Maximum FCV, FC, FCP, OSC, OSD, OSE, or OSN channel paths (Note 3)	240	80	336
Maximum FCP, OSC, OSD, OSE, or OSN channel paths	240	80	256
Maximum OSC, OSD, OSE, or OSN channel paths	48	40	48
Maximum CFS, CFR, CFP, CBS, CBR, CBP, or ICP channel paths	64	64	64
Maximum CFS, CFR, or CFP channel paths	48	48	48
Maximum CFS or CFR channel paths	32	32	N/A
Maximum CBS or CBR channel paths	8	N/A	N/A
Maximum CBP channel paths	32	16	32
Maximum ICP channel paths	32	32	32
Maximum IQD channel paths	16	16	16
IOCP Storage Requirement			
Minimum storage required by IOCP	38MB*	20MB*	73MB*
* K=1024, MB=1 048 576 bytes			

Table F-4. Valid CHPID Types

CHPID Type	Machine Type (Note 1)		
	2084,1	2086,1	2094,1
CBY	Yes	Yes	Yes
CVC	Yes	Yes	Yes
CNC	Yes	Yes	Yes
CTC	Yes	Yes	Yes
CFS	Yes	Yes	No
CFR	Yes	Yes	No
CFP	Yes	Yes	Yes
CBS	Yes	No	No
CBR	Yes	No	No
CBP	Yes	Yes	Yes
ICP	Yes	Yes	Yes
OSC (Note 5)	Yes	Yes	Yes
OSD	Yes	Yes	Yes
OSE	Yes	Yes	Yes
OSN	No	No	Yes
FCV	Yes	Yes	Yes
FC	Yes	Yes	Yes
FCP (Note 4)	Yes	Yes	Yes
IQD	Yes	Yes	Yes

Notes:

1. Machine type refers to the value specified in the SYSTEM keyword of the ID statement.
   - SYSTEM=(2084,1) specifies a 2084 zSeries 990 Model A08, B16, C24, or D32.
   - SYSTEM=(2086,1) specifies a 2086 zSeries 890 Model A04.

     Note that the smallest sub-uniprocessor equipped capacity setting has additional restrictions IOCP does not enforce (for example, a maximum of 240 ESCON channels, 24 OSA channels, and 15 logical partitions).
   - SYSTEM=(2094,1) specifies a 2094 System z9 109 Model S08, S18, S28, S38, or S54.
2. The 2084 models support 15 logical partitions at EC J12560 and 30 logical partitions at EC J12560 (with a LIC patch installed) or later.
3. This maximum is intended to inform the user when more than 60 of these types of cards are defined on a 2084 or 2094 CPC or 20 cards on a 2086 CPC. This maximum can be reached only if every card is FICON Express2. Also, this maximum includes PCI Cryptographic cards installed on your CPC. However, PCI cryptographic cards are not defined to IOCP and IOCP cannot include them in its checking of this maximum.
4. The 2084 models support FCP channel paths at EC J12560 (with a LIC patch installed) or later.
5. The 2084 models support OSC channel paths at EC J13486.

6. The 2084 models support a maximum CSS ID of 1 at EC J12560 and a maximum CSS ID of 3 at EC J13486.

Keyword Applicability

Table F-5 lists the keyword applicability for the channel path types that IOCP supports.

Table F-5. Keyword Applicability

	Channel Path Type									
Keyword	**CVC**	**CBY**	**CNC CTC FCV**	**CFP CBP ICP**	**CFS CBS**	**CFR CBR**	**OSC OSD OSE OSN**	**FC**	**IQD**	**FCP**
CHPID										
PCHID	Yes	Yes	Yes	Yes (1)	Yes	Yes	Yes	Yes	No	Yes
PATH to span *chpid*	No	No	No	Yes (5)	Yes (5)	No	Yes (5)	Yes (5)	Yes (5)	Yes (5)
SWITCH	Yes	Yes	Yes	No	No	No	No	Yes	No	No
NOTPART	No	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
SHARED	No	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
CPATH	No	No	No	Yes (3)	No	No	No	No	No	No
CHPARM	No	No	Yes (4)	No	No	No	Yes (4)	Yes	Yes	No
CNTLUNIT										
LINK	Yes	Yes	Yes	No	No	N/A	No	Yes	No	No
CUADD	No	No	Yes	No	No	N/A	Yes (6)	Yes	Yes	No
PROTOCL	Yes	No	No	No	No	N/A	No	No	No	No
SHARED	Yes	No	No	No	No	N/A	No	No	No	No
UNITADD	Yes	Yes	Yes	No	No	N/A	No	Yes	No	No
IODEVICE										
PART, PARTITION, or NOPART	No	No	Yes	No	No	N/A	Yes	Yes	Yes	Yes
PATH	Yes	Yes	Yes (2)	No	No	N/A	No	Yes	No	No
SCHSET	No	No	Yes	No	No	N/A	Yes	Yes	Yes	Yes
STADET	Yes	Yes	Yes	No	No	N/A	No	Yes	No	No
TIMEOUT	Yes	No	No	No	No	N/A	No	No	No	No
UNITADD	Yes	Yes	Yes	No	No	N/A	Yes	Yes	Yes	Yes

1. The PCHID keyword is not allowed for ICP channel paths.
2. The PATH keyword on the IODEVICE statement is ignored for CTC channel paths.
3. Only ICP channel paths can specify the CPATH keyword.
4. The CHPARM keyword is allowed for CNC, FCV, and OSD channel paths.
5. ICP and IQD channel paths can be spanned on 2084 models at EC J12560 (with a LIC patch installed) or later and all other models. FC, FCP, CFS, CBS, CFP, CBP, OSC, OSD, and OSE channel paths can be spanned on 2084 models at EC J13486 and all other models.
6. The CUADD keyword is allowed for OSD channel paths.

CPC Activation and Power-on Reset Error

CPCs can fail activation or power-on reset (POR) if the selected IOCDS contains an unsupported function or channel path type for the CPC. This can occur if your CPC does not yet support a function allowed by IOCP. The activation or power-on reset will fail with error message (ACTZ16F) as follows:

```
The requested operation cannot be performed because some element of the
configuration defined in the input/output configuration data set (IOCDS)
is not supported. xxxxxxxx xxxxxxxx indicates the unsupported function or
channel type.

See section 'CPC Activation and power-on reset Error' in the 'Machine
Limits and Rules' appendix in the IOCP User's Guide for the supported
functions and channel types. Verify that the IOCDS definition is correct for
this machine EC level.

Contact IBM support for further help.
```

This CPC error message contains a hexadecimal field that identifies the unsupported function or channel path type. Use the following table to determine which function or channel path type is incorrect for your CPC and write a new IOCDS that does not contain it. Also, the following hexadecimal values describe what the Support Element (SE) displays when you click the **Supported I/O Mask** under **View** on the Input/Output Configuration task window. If there is a mismatch between the Supported I/O mask and the IOCDS mask that the SE displays, an Unsupported mask is displayed that contains only the unsupported functions or channel path types. Also, power-on reset fails with the IOCDS at the current EC.

IOCP warning message ICP065I also contains a hexadecimal field which identifies unsupported functions or channel path types. The following hexadecimal values describe what is displayed by this message.

Table F-6. Activation and POR Error Message Hexadecimal Values

Channel Path Type or IOCP Function	**Hexadecimal Value**
Spanned ICP or IQD channel path (Notes 1, 2)	80000000 00000000
CSS ID > 1 or spanned FC, FCP, CFS, CBS, CFP, CBP, OSC, OSD, or OSE channel path defined (Notes 1, 3)	40000000 00000000
OSD channel path defined with non-zero CHPARM or OSD control unit defined with non-zero CUADD (Notes 1, 4)	20000000 00000000
CHECKCPC=NO or NOCHKCPC	01000000 00000000
IQD	00000000 04000000
FCP	00000000 02000000
ICP	00000000 01000000
CBP	00000000 00800000
CFP	00000000 00400000
OSC	00000000 00200000
OSE	00000000 00100000
OSD	00000000 00080000
OSN	00000000 00020000
FC	00000000 00008000
FCV	00000000 00004000
CBR	00000000 00002000
CBS	00000000 00001000
CFR	00000000 00000100
CFS	00000000 00000080
CBY	00000000 00000020
CVC	00000000 00000010
CTC	00000000 00000008
CNC	00000000 00000004

Notes:

1. This value is set only for 2084 models.
2. This IOCP function is supported on 2084 models at EC J12560 (with a LIC patch installed) or later.
3. This IOCP function is supported on 2084 models at EC J13486.
4. This IOCP function is supported on 2084 models at EC J13486 (with a LIC patch installed)

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Glossary

This glossary includes terms and definitions from:

- *Dictionary of Computing*, SC20-1699.
- *American National Standard Dictionary for Information Systems*, ANSI X3.172-1990, copyright 1990 by the American National Standards Institute (ANSI). Copies can be purchased from the American National Standards Institute, 1430 Broadway, New York, New York 10018. Definitions are identified by the symbol (A) after the definition.
- *ANSI/EIA Standard - 440A: Fiber Optic Terminology*, copyright 1989 by the Electronics Industries Association (EIA). Copies can be purchased from the Electronic Industries Association, 2001 Pennsylvania Avenue N.W., Washington, D.C. 20006. Definitions are identified by the symbol (E) after the definition.
- *Information Technology Vocabulary*, developed by Subcommittee 1, Joint Technical Committee 1, of the International Organization for Standardization and the International Electrotechnical Commission (ISO/IEC JTC1/SC1). Definitions of published parts of this vocabulary are identified by the symbol (I) after the definition; definitions taken from draft international standards, committee drafts, and working papers being developed by ISO/IEC JTC1/SC1 are identified by the symbol (T) after the definition, indicating that final agreement has not yet been reached among the participating National Bodies of SC1.

The following cross-references are used in this glossary:

Contrast with
This refers to a term that has an opposed or substantively different meaning.

See This refers the reader to multiple-word terms in which this term appears.

See also
This refers the reader to terms that have a related, but not synonymous, meaning.

Synonym for
This indicates that the term has the same meaning as a preferred term, which is defined in the glossary.

A

absolute address. (1) A direct address that identifies a location without reference to a base address. An absolute address may itself be a base address. (T) (2) In ESA/390 mode, an address that exists after translation and prefixing, but before configuration occurs. See also *logical address*, *physical address*, *real address*, and *virtual address*.

ac. Alternating current.

AC. Action code.

access method. (1) A technique to obtain the use of data, storage, or the use of an input/output channel to transfer data; for example, random access method, sequential access method. (T) (2) A technique for moving data between main storage and input/output devices.

active configuration. In an ESCON environment, the ESCON Director configuration determined by the status of the current set of connectivity attributes. Contrast with *saved configuration.*

active subchannel. A subchannel that is locked and either busy or has a pending interrupt, and is indicated by subchannel status word (SCSW) bit 24 equals 1. The control information resides in the channel subsystem because it is necessary for the current operation. Contrast with *inactive subchannel*. See also *busy subchannel*.

Note: An active subchannel can also reside in the local working storage of an IOP or channel.

adapter. (1) Hardware that provides some transitional functions between two or more devices. (2) A mechanism for attaching parts, for example, parts having different diameters. (3) In an ESCON environment, link hardware used to join different optical fiber connector types.

address. (1) A value that identifies a register, a particular part of storage, a data source, or a data sink. The value is represented by one or more characters. (T) (2) To refer to a device or an item of data by its address. (I) (A) (3) The location in the storage of a computer where data is stored. (4) In data communication, the unique code assigned to each device or workstation connected to a network. (5) The identifier of a location, source, or destination.

allocate. To assign a resource, such as a disk or a diskette file, to perform a task. Contrast with *deallocate*.

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American National Standard Code for Information Interchange (ASCII). The standard code, using a coded character set consisting of 7-bit coded characters (8 bits including parity), used for information interchange among data processing systems, data communication systems, and associated equipment. The ASCII set consists of control characters and graphics characters. (A)

Note: IBM has defined an extension to ASCII code (characters 128-255).

ANSI. American National Standards Institute.

application. (1) The use to which an information processing system is put, for example, a payroll application, an airline reservation application, a network application. (2) A collection of software components used to perform specific types of work on a computer.

ASCII. American National Standard Code for Information Interchange.

ASI. Active state indicator.

B

basic mode. A central processor mode that does not use logical partitioning. Contrast with *logically partitioned (LPAR) mode*.

basic telecommunications access method (BTAM). An access method that permits read/write communication with remote devices.

batch. (1) An accumulation of data to be processed. (2) A group of records or data processing jobs brought together for processing or transmission. (3) Pertaining to activity involving little or no user action. Contrast with *interactive*.

bit. Either of the digits 0 or 1 when used in the binary numeration system. (T) See also *byte*.

block. A string of data elements recorded or transmitted as a unit. The element may be characters, words, or physical records. (T)

block multiplexer channel. A multiplexer channel that interleaves blocks of data. Contrast with *selector channel*. See also *byte multiplexer channel*.

BOC. Battery-operated clock.

BTAM. Basic telecommunications access method.

buffer. (1) A routine or storage used to compensate for a difference in rate of flow of data, or time of occurrence of events, when transferring data from one device to another. (A) (2) To allocate and schedule the use of buffers. (A) (3) A portion of storage used to hold input or output data temporarily. See fiber buffer.

burst. In data communication, a sequence of signals counted as one unit in accordance with some specific criterion or measure. (A)

bus. (1) A facility for transferring data between several devices located between two end points, only one device being able to transmit at a given moment. (T) (2) A network configuration in which nodes are interconnected through a bidirectional transmission medium. (3) One or more conductors used for transmitting signals or power. (A)

busy subchannel. A subchannel that is either active and locked, inactive with an I/O operation pending or in process, or between commands in a multiplex operation. See also *active subchannel* and *inactive subchannel*.

byte. (1) A string that consists of a number of bits, treated as a unit, and representing a character. (T) (2) A binary character operated upon as a unit and usually shorter than a computer word. (A) (3) A string that consists of a particular number of bits, usually eight, that is treated as a unit, and that represents a character. (4) A group of eight adjacent binary digits that represent one extended binary-coded decimal interchange code (EBCDIC) character.

byte multiplexer channel. A multiplexer channel that interleaves bytes of data. Contrast with *selector channel*. See also *block multiplexer channel*.

C

cache. (1) A special purpose buffer storage, smaller and faster than main storage, used to hold a copy of the instructions and data obtained from main storage and likely to be needed next by the processor. (T) (2) A buffer storage that contains frequently accessed instructions and data; it is used to reduce access time.

CB. Circuit breaker.

CC. Condition code.

CCC. Channel control check.

CCS. Clock control section.

CCW. Channel command word.

CDC. Channel data check.

CE. (1) Correctable error. (2) Channel end.

central processor. A processor that contains the sequencing and processing facilities for instruction execution, interruption action, timing functions, initial program loading, and other machine-related functions.

central processor complex (CPC). A physical collection of hardware that consists of central storage, one or more central processors, timers, and channels.

central storage. Storage that is an integral part of the processor and includes both main storage and the hardware system area.

channel. The system element that controls one channel path, whose mode of operation depends on the type of hardware to which it is attached.

channel-attached. (1) Pertaining to attachment of devices directly by data channels (I/O channels) to a computer. (2) Pertaining to devices attached to a controlling unit by cables rather than by telecommunication lines. Contrast with *link-attached*.

channel command word (CCW). A doubleword at the location in main storage specified by the channel address word. One or more CCWs make up the channel program that directs data channel operations.

channel control check. A category of I/O errors affecting channel controls and sensed by the channel to which a device is attached. See also *channel data check*.

channel data check. A category of I/O errors, indicating a machine error in transferring data to or from storage and sensed by the channel to which a device is attached. See also *channel control check*.

channel Licensed Internal Code. That part of the channel subsystem Licensed Internal Code used to start, maintain, and end all operations on the I/O interface. See also *IOP Licensed Internal Code*.

channel path (CHP). A single interface between a central processor and one or more control units along which signals and data can be sent to perform I/O requests.

channel path configuration. In an ESCON environment, the connection between a channel and a control unit or between a channel, an ESCON Director, and one or more control units. See also *link*, *point-to-point channel path configuration*, and *switched point-to-point channel path configuration*.

channel path identifier (CHPID). In a channel subsystem, a value assigned to each installed channel path of the system that uniquely identifies that path to the system.

channel status word (CSW). An area in storage that provides information about the termination of input/output operations.

channel subsystem (CSS). A collection of subchannels that directs the flow of information between I/O devices and main storage, relieves the processor of communication tasks, and performs path management functions.

channel subsystem (CSS) Licensed Internal Code. Code that consists of the IOP Licensed Internal Code and the channel Licensed Internal Code.

CHN. Channel.

CHP. Channel path.

CHPID. Channel path identifier.

circuit breaker (CB). An electrical-overload and short-circuit protector that can be reset manually.

cladding. In an optical cable, the region of low refractive index surrounding the core. See also *core* and *optical fiber*.

cm. Centimeter.

CM. Channel monitor.

CMS. Conversational monitor system.

CNC. Mnemonic for an ESCON channel attached to an ESCON-capable device.

column. A vertical arrangement of data. Contrast with *row*.

command. (1) A character string from a source external to a system that represents a request for system action. (2) A request from a terminal for performance of an operation or execution of a program. (3) A value sent on an I/O interface from a channel to a control unit that specifies the operation to be performed.

command area. The area on a screen that contains the command entry field.

command chaining. The fetching of a new channel command word (CCW) immediately following the completion of the previous CCW.

component. (1) Hardware or software that is part of a functional unit. (2) A functional part of an operating system; for example, the scheduler or supervisor.

concurrent maintenance. Hardware maintenance actions performed by a service representative while normal operations continue without interruption. See also *nondisruptive installation* and *nondisruptive removal*.

configuration. (1) The arrangement of a computer system or network as defined by the nature, number, and the chief characteristics of its functional units. More specifically, the term configuration may refer to a hardware configuration or a software configuration. (I) (A) (2) In an ESCON Director, the physical connection capability determined by a set of attributes. The attribute values specify the connectivity control status and identifiers associated with the ESCD and its ports. See also *active configuration*, *configuration matrix*, *connectivity attribute*, and *saved configuration*.

configuration matrix. In an ESCON environment, an array of connectivity attributes that appear as rows and columns on a display device and can be used to determine or change active and saved configurations.

connectivity attribute. In an ESCON Director, the characteristic that determines a particular element of a port's status.

connector. A means of establishing electrical flow. (A) See *optical fiber connector*.

console. A logical device used for communication between the user and the system. (A) See *display station*, *monitor console*, *operator console*, *program mode console*, *programming support console*, *service console*, and *system console*.

control block. A storage area used by a computer program to hold control information. (I)

controller. A control unit that controls input/output operations for one or more devices.

control program. A computer program designed to schedule and to supervise the execution of programs of a computer system. (I) (A)

control unit. A hardware unit that controls the reading, writing, or displaying of data at one or more input/output units.

control unit headers. A group of contiguous words in the hardware system area that provides all of the information necessary to control I/O operations through a group of paths that are defined in the IOCDS. Control unit headers represent to the I/O subsystem a set of control units that attach common I/O devices.

conversational monitor system (CMS). A virtual machine operating system that provides general interactive time sharing, problem solving, and program development capabilities, and operates only under the VM control program.

core. (1) In an optical cable, the central region of an optical fiber through which light is transmitted. (E) (2) In an optical cable, the central region of an optical fiber that has an index of refraction greater than the surrounding cladding material. (E) See also *cladding* and *optical fiber*.

coupling facility. A special logical partition that provides high-speed caching, list processing, and locking functions in a sysplex.

coupling facility channel. A high bandwidth fiber optic channel that provides the high-speed connectivity required for data sharing between a coupling facility and the central processor complexes (or logical partitions) directly attached to it.

coupling facility control code. The Licensed Internal Code (LIC) that runs in a coupling facility logical partition to provide shared storage management functions for a sysplex.

CP. Central processor.

CPC. Central processor complex.

critical resource. A resource required for system operation. See also *system resource*.

CRW. Channel report word.

CSS. Channel subsystem.

CSW. Channel status word.

CTC. (1) Channel-to-channel. (2) Mnemonic for an ESCON channel attached to another ESCON channel.

CU. Control unit.

CUA. Control unit address.

CUADD. Control unit logical address.

cursor. (1) A movable, visible mark used to indicate the position at which the next operation will occur on a display screen. (A) (2) A visual cue that shows the user where keyboard input will appear on the screen.

CUU. Channel and unit address.

CVC. Mnemonic for an ESCON channel attached to a 9034.

D

DASD. Direct access storage device.

DASD subsystem. A storage control and its attached direct access storage devices.

data control block (DCB). A control block used by access method routines in storing and retrieving data.

data flow. Data movement, staging, and control through a system, a functional element, or a component measured in standard units of time, clock cycles, or internal operations.

data streaming. In an I/O interface, a mode of operation that provides a method of data transfer at up to 4.5 megabytes per second. Data streaming is not interlocked between the sender and the receiver. Once data transfer begins, the sender does not wait for acknowledgment from the receiver before sending the next byte. The control unit determines the data transfer rate. Contrast with *direct-coupled interlock (DCI)*.

data transfer. (1) The result of the transmission of data signals from any data source to a data receiver. (2)

The movement, or copying, of data from one location and the storage of the data at another location.

dc. Direct current.

DCB. Data control block.

DCI. Direct-coupled interlock.

DE. Device end.

deallocate. To release a resource assigned to a task. Contrast with *allocate*.

deconfigure. To remove a system resource from the currently active configuration, usually through the system control program (SCP) or through the Configuration (CONFIG) frame on the system console.

dedicated connection. In an ESCON Director, a connection between two ports that is not affected by information contained in the transmission frames. This connection, which restricts those ports from communicating with any other port, can be established or removed only as a result of actions performed by a host control program or at the ESCD console. Contrast with *dynamic connection*.

Note: The two links having a dedicated connection appear as one continuous link.

default. Pertaining to an attribute, value, or option that is assumed when none is explicitly specified. (I)

delimiter. A character used to indicate the beginning or end of a character string. (T)

device. A mechanical, electrical, or electronic contrivance with a specific purpose.

device-level addressing. In an ESCON I/O interface, one of two levels of addressing, this level pertaining to an I/O device and identifying that device to the channel or control unit once the control unit has been determined through link-level addressing. Contrast with *link-level addressing*.

device number. In a channel subsystem, four hexadecimal digits that uniquely identify an I/O device.

diagnostics. The process of investigating the cause or the nature of a condition or a problem in a product or system. Modules or tests used by computer users and service personnel to diagnose hardware problems.

DID. Domain identifier.

direct access storage. A storage device that provides direct access to data. (I) (A) See also *random access memory*.

direct access storage device (DASD). A device in which access time is effectively independent of the location of the data.

direct-coupled interlock (DCI). In an I/O interface, a mode of operation that provides a method of data transfer at up to 1.5 megabytes per second. DCI protocol requires the sender to raise a signal on the interface along with the byte of data being transferred. This signal and the accompanying data must be maintained until the receiver of the data sends a signal acknowledging that the data has been received. Contrast with data streaming.

disk. A round, flat, data medium that is rotated in order to read and write data. (T) See also *diskette*.

diskette. A thin, flexible magnetic disk enclosed in a protective jacket. See also *disk*.

diskette drive. The mechanism used to seek, read, and write data on diskettes.

disk operating system (DOS) . An operating system for computer systems that use disks and diskettes for auxiliary storage of programs and data.

display device. (1) An output unit that gives a visual representation of data. Usually the data are displayed temporarily; however, arrangements may be made for making a permanent record. (I) (A) (2) In computer graphics, a device capable of presenting display elements on a display surface; for example, a cathode ray tube, plotter, microfilm viewer, or printer. (3) A device that presents information on a screen. See also *display image* and *display screen*.

display frame. In computer graphics, an area in storage in which a display image can be recorded.

display image. (1) A collection of display elements or segments that are represented together at any one time on a display surface. (I) (A) (2) Information, pictures, or illustrations that appear on a display screen. See also *display device* and *display screen*.

display/printer adapter (DPA). An integrated control unit contained on each side of the processor controller that provides attachment capability for displays and printers.

display screen. (1) A display surface on which display images are presented. (2) The part of a display station or workstation on which information is displayed. See also *display device* and *display image*.

display station. (1) A physical device that can be used as multiple logical consoles. See also *console*. (2) An input/output device containing a display screen and an attached keyboard that allows a user to send information to or receive information from the system. See also *terminal* and *workstation*.

DOS . Disk operating system.

duplex receptacle. In an ESCON environment, a fixed or stationary optical fiber component that provides a keyed attachment method for a duplex connector.

dynamic connection. In an ESCON Director, a connection between two ports, established or removed by the ESCD and that, when active, appears as one continuous link. The duration of the connection depends on the protocol defined for the frames transmitted through the ports and on the state of the ports. Contrast with *dedicated connection*.

E

EBCDIC. Extended binary-coded decimal interchange code.

element. A major part of a component (for example, the buffer control element) or a major part of a system (for example, the system control element).

emulation. The use of programming techniques and special machine features to permit a computing system to execute programs written for another system. Imitation; for example, imitation of a computer or device. Contrast with *simulation*.

environmental error record editing and printing program (EREP). The program that makes the data contained in the system recorder file available for further analysis.

erase. To remove information, leaving the space unoccupied.

EREP. Environmental error record editing and printing program.

error. A discrepancy between a computed, observed, or measured value or condition and the true, specified, or theoretically correct value or condition. (I) (A) Contrast with *failure* and *fault*.

error message. An indication that an error has been detected. (A) See also *information message* and *warning message*.

ESA. Expanded storage array.

ESA/390. Enterprise Systems Architecture/390®.

ESCON. Enterprise Systems Connection.

ESCON channel. A channel having an Enterprise Systems Connection channel-to-control-unit I/O interface that uses optical cables as a transmission medium. Contrast with *parallel channel.*

event. An occurrence or happening. An occurrence of significance to a task; for example, the completion of an asynchronous operation, such as an input/output operation.

exchange. To remove an item and put another in its place; for example, to remove a field-replaceable unit (FRU) and install another of the same type.

expanded storage. Optional high-speed storage that transfers 4KB pages to and from central storage.

extended binary-coded decimal interchange code (EBCDIC). A coded character set of 256 eight-bit characters.

F

facility. (1) An operational capability, or the means for providing such a capability. (T) (2) A service provided by an operating system for a particular purpose; for example, the checkpoint/restart facility.

failure. An uncorrected hardware error. Contrast with *error* and *fault*.

Note: Failures are either recoverable or not recoverable by the software or the operator. The operator is always notified when failures occur. Usually, system recovery occurs through a hardware reconfiguration. If this is not possible, recovery requires a repair of the failed hardware.

fault. An accidental condition that causes a functional unit to fail to perform its required function. (I) (A) Contrast with *error* and *failure*.

FCC. Federal Communications Commission.

FE. Functional element.

feature. A part of an IBM product that may be ordered separately by the customer. A feature is designated as either special or specify and may be designated also as diskette-only.

Federal Communications Commission (FCC). A board of commissioners appointed by the President under the Communications Act of 1934, having the power to regulate all interstate and foreign communications by wire and radio originating in the United States.

FEID. Functional element identifier.

fiber. See *optical fiber*.

fiber buffer. Material used to protect an optical fiber from physical damage, thereby providing mechanical isolation or protection, or both.

Note: Cable fabrication techniques vary. Some result in tight contact between fiber and protective buffering (tight buffer), while others result in a loose fit (loose buffer), permitting the fiber to slide in the buffer tube. Multiple buffer layers can be used for added fiber protection.

fiber optics. The branch of optical technology concerned with the transmission of radiant power through fibers made of transparent materials such as glass, fused silica, and plastic. (E)

Note: Telecommunication applications of fiber optics use optical fibers. Either a single discrete fiber or a non-spatially aligned fiber bundle can be used for each information channel. Such fibers are often called optical fibers to differentiate them from fibers used in non-communication applications.

flag. (1) A variable that indicates a certain condition holds. (T) (2) Any of various types of indicators used for identification; for example, a wordmark. (A) (3) A character that signals the occurrence of some condition, such as the end of a word. (A)

floating-point. Pertaining to the representation of a quantity as a decimal number and using a symbol (exponent) to show the position for the decimal point, for example, 199.9 represented by 1.999-2. Pertaining to a machine feature for such arithmetic.

FM. Frequency modulation.

frame. (1) A housing for machine elements. (2) The hardware support structure, covers, and all electrical parts mounted therein that are packaged as one entity for shipping. (3) A formatted display. See *display frame* and *transmission frame*.

ft. Foot.

functional element identifier (FEID). An alphanumeric character or characters identifying a component or element in service language or other diagnostic application programs.

G

giga (G). Ten to the ninth power; 1 000 000 000 in decimal notation. When referring to storage size, 2 to the thirtieth power, 1 073 741 824 in decimal notation.

guest. In interpretive execution mode, the interpreted or virtual machine as opposed to the real machine (the host).

H

hard disk. A rigid disk used in a hard disk drive.

hard error. An error condition on a network that requires that the network be reconfigured or that the source of the error be removed before the network can resume reliable operation. Contrast with *soft error*.

Hardware Management Console. A console used to monitor and control hardware such as the 2084 central processor complex (CPC).

hardware system area (HSA). A logical area of central storage, not addressable by application programs, used to store Licensed Internal Code and control information.

hexadecimal. (1) Pertaining to a selection, choice, or condition that has 16 possible values or states. (I) (2) Pertaining to a fixed-radix numeration system, with radix of 16. (I) (3) Pertaining to a numbering system with base of 16; valid numbers use the digits 0-9 and characters A-F, where A represents 10 and F represents 15.

hexadecimal number . The 1-byte hexadecimal equivalent of an EBCDIC character.

host. In interpretive execution mode, the real machine as opposed to the virtual or interpreted machine (the guest).

hp. Horsepower.

HPO. High performance option.

HSA. Hardware system area.

I

IBM program support representative (PSR). An IBM service representative who performs maintenance services for IBM software at a centralized IBM location. Contrast with *IBM systems engineering operations specialist.*

IBM systems engineering operations specialist. An IBM service representative who performs maintenance services for IBM software in the field. Contrast with *IBM program support representative*.

ICE. Interconnect communication element.

ICMF. Integrated coupling migration facility

ID. Identifier.

identifier (ID). (1) One or more characters used to identify or name a data element and possibly to indicate certain properties of that data element. (T) (2) A sequence of bits or characters that identifies a program, device, or system to another program, device, or system. (3) In an ESCON Director, a user-defined symbolic name of 24 characters or fewer that identifies a particular ESCD. See also *password identifier* and *port address name*.

IF. Instruction fetch.

IML. Initial machine load.

inactive subchannel. A subchannel that is busy (even if unlocked), not busy, or has a pending interrupt, and is indicated by subchannel status word (SCSW) bit 24 equals 0. The control information resides outside the

channel subsystem because it is not necessary for the current operation. Contrast with *active subchannel*. See also *busy subchannel*.

information message. A message telling a user that a function is performing normally or has completed normally. User acknowledgment may not be required, depending on the message. See also error message and warning message.

initialization. (1) The operations required for setting a device to a starting state, before the use of a data medium, or before implementation of a process. (T) (2) Preparation of a system, device, or program for operation. (3) To set counters, switches, addresses, latches, or storage contents to zero or to other starting values at the beginning of, or at the prescribed points in, a computer program or process.

initial machine load (IML). A procedure that prepares a device for use.

initial program load (IPL). (1) The initialization procedure that causes an operating system to commence operation. (2) The process by which a configuration image is loaded into storage at the beginning of (3) a work day or after a system malfunction. The process of loading system programs and preparing a system to run jobs.

input/output (I/O). (1) Pertaining to a device whose parts can perform an input process and an output process at the same time. (I) (2) Pertaining to a functional unit or channel involved in an input process, output process, or both, concurrently or not, and to the data involved in such a process. (3) Pertaining to input, output, or both.

input/output address. In ESA/390 mode, an address provided by the channel subsystem that consists of four parts: channel path identifiers, subchannel numbers, device numbers, and addresses (called device identifiers). Device identifiers are dependent on the channel path type and not visible to programs. See *channel path identifier*, *device identifier, device number*, and *subchannel number*.

input/output configuration. The collection of channel paths, control units, and I/O devices that attaches to the processor.

input/output configuration data set (IOCDS). The data set that contains an I/O configuration definition built by the I/O configuration program (IOCP).

input/output configuration program (IOCP). A program that defines to a system all the available I/O devices and the channel paths.

input unit. A device in a data processing system by means of which data can be entered into the system. (I) (A) Contrast with output unit.

instruction address. (1) The address of an instruction word. (I) (A) (2) The address that must be used to fetch an instruction. (A)

integrated coupling migration facility (ICMF). A PR/SM LPAR facility that emulates coupling facility channels for logical partitions (coupling facility LPs and z/OS LPs) running on the same central processor complex to assist in the test and development of data sharing applications.

integrated offload processor (IOP). The processor in the interconnect communication element that detects, initializes, and ends all channel subsystem operations.

interactive. Pertaining to a program or system that alternately accepts input and then responds. An interactive system is conversational; that is, a continuous dialog exists between the user and the system. Contrast with *batch*.

interface. (1) A shared boundary between two functional units, defined by functional characteristics, signal characteristics, or other characteristics as appropriate. The concept includes the specification of the connection of two devices having different functions. (T) (2) Hardware, software, or both, that links systems, programs, or devices.

interrupt. (1) A suspension of a process, such as execution of a computer program caused by an external event, and performed in such a way that the process can be resumed. (A) (2) To stop a process in such a way that it can be resumed. (3) In data communication, to take an action at a receiving station that causes the sending station to end a transmission. (4) To temporarily stop a process.

interruption. Synonym for interrupt.

I/O. Input/output.

IOCDS. I/O configuration data set.

IOCDSM. I/O configuration data set management.

IOCP. I/O configuration program.

IOP. Integrated offload processor.

IOPD. I/O problem determination.

IOP Licensed Internal Code. The part of the channel subsystem Licensed Internal Code used to start, maintain, and end (normally or abnormally) all operations with the central processor. See also *channel Licensed Internal Code*.

IPL. Initial program load.

J

JCL. Job control language.

JES. Job entry subsystem.

job control language (JCL). A control language used to identify a job to an operating system and to define the job's requirements.

job entry subsystem (JES). A system facility for spooling, job queuing, and managing I/O.

L

LAN. Local area network.

LCL. Limited channel logout.

LIC. Licensed Internal Code.

Licensed Internal Code (LIC). Software provided for use on specific IBM machines and licensed to customers under the terms of IBM's Customer Agreement. Microcode can be Licensed Internal Code and licensed as such.

limited channel logout (LCL). A detailed I/O error record, contained in the hardware system area of central storage, that can be used with the fixed logout when a failure occurs.

Note: This logout is not necessarily available for all channels.

link. (1) In an ESCON environment, the physical connection and transmission medium used between an optical transmitter and an optical receiver. A link consists of two conductors, one used for sending and the other for receiving, providing a duplex communication path. (2) In an ESCON I/O interface, the physical connection and transmission medium used between a channel and a control unit, a channel and an ESCD, a control unit and an ESCD, or, at times, between two ESCDs.

link address. In an ESCON environment, an address assigned at initialization that identifies a channel or control unit and allows it to send and receive transmission frames and perform I/O operations. See also *port address*.

link-attached. Pertaining to devices that are connected to a controlling unit by a data link. Contrast with *channel-attached*.

link-level addressing. In an ESCON I/O interface, one of two levels of addressing, this level pertaining to link-level functions and identifying the channel path between the channel and a control unit. Contrast with *device-level addressing*.

local. Synonym for *channel-attached*.

local area network (LAN). A computer network located on a user's premises within a limited geographical area. Communication within a local area network is not subject to external regulations; however, communication across the LAN boundary can be subject to some form of regulation.

Note: A LAN does not use store and forward techniques.

local working storage. A storage area immediately available to a central processor or the channel subsystem and used to temporarily hold data or control information necessary for the operation being performed.

Note: General registers and floating-point registers are not included.

log. (1) To record, for example, to log all messages on the system printer. (2) A record of events that have occurred.

logical address. The address found in the instruction address portion of the program status word (PSW). If translation is off, the logical address is the real address. If translation is on, the logical address is the virtual address. See also *absolute address*, *physical address*, *real address*, and *virtual address*.

logically partitioned (LPAR) mode. A central processor mode, available on the Configuration frame when using the PR/SM feature, that allows an operator to allocate processor unit hardware resources among logical partitions. Contrast with *basic mode*.

logical partition (LP). A subset of the processor hardware that is defined to support the operation of a system control program (SCP). See also *logically partitioned (LPAR) mode*.

logout. Log data that has been collected, formatted, and recorded.

loop. A sequence of instructions that is to be executed iteratively (T) A closed unidirectional signal path connecting input/output devices to a system.

LP. Logical partition.

LPAR. Logically partitioned.

M

machine check. An error condition that is caused by an equipment malfunction.

main storage. (1) Program-addressable storage from which instructions and other data can be loaded directly into registers for subsequent processing. (I) (A) (2) That

part of internal storage into which instructions and other data must be loaded for subsequent execution or processing. (3) The part of a processor unit where programs are run. See *central storage*.

Notes:

1. Main storage refers to the whole program-addressable execution space and can include one or more storage devices.
2. The term main storage is generally used in large and intermediate computers. The term memory is primarily used in microcomputers, calculators, and some minicomputers.

maintenance analysis procedure (MAP) . A step-by-step procedure for tracing a symptom to the cause of a failure.

MAP. Maintenance analysis procedure.

mark. A symbol or symbols that indicate the beginning or the end of a field, a word, an item of data or a set of data such as a file, record, or block. (I) (A)

Mb. Megabit.

MB. Megabyte.

MBA. Memory bus adapter.

megabit (Mb). A unit of measure for throughput. One megabit equals 1 000 000 bits.

megabyte (MB). (1) A unit of measure for storage size. One megabyte equals 1 048 576 bytes. (2) Loosely, one million bytes.

MES. Miscellaneous equipment specification.

MI. Manual intervention.

microsecond. One-millionth of a second.

MIH. Missing interruption handler.

mm. Millimeter.

modulation. The process by which a characteristic of a carrier is varied in accordance with the characteristic of an information-bearing signal. (T)

monitor. A device that observes and records selected activities within a data processing system for analysis.

monitor console. An optional logical display used to monitor the service or system console. Each monitor console can be assigned to any of the physical displays attached to the processor controller.

multimode optical fiber. A graded-index or step-index optical fiber that allows more than one bound mode to propagate. (E) Contrast with *single-mode optical fiber*.

multiplexer channel . A channel designed to operate with a number of I/O devices simultaneously. Several I/O devices can transfer records at the same time by interleaving items of data. See *block multiplexer channel* and *byte multiplexer channel*.

multiplexing. In data transmission, a function that permits two or more data sources to share a common transmission medium so that each data source has its own channel. (I) (A)

multiprocessor (MP). A processor complex that can be physically partitioned to form two operating processor complexes.

N

N/A. (1) Not applicable. (2) Not available.

network. (1) An arrangement of nodes and connecting branches. (T) (2) A configuration of data processing devices and software connected for information exchange.

NO. Normally open.

nondisruptive installation. The physical installation of additional units while normal operations continue without interruption. Contrast with *nondisruptive removal*. See also *concurrent maintenance*.

nondisruptive removal. The physical removal of existing units while normal operations continue without interruption. Contrast with *nondisruptive installation*. See also *concurrent maintenance*.

NOR. Normal output request.

NTF. No trouble found.

numeric. (1) Pertaining to data that consists of numerals. (T) (2) Pertaining to data or to physical quantities that consist of numerals. (A) (3) Pertaining to any of the digits 0 through 9.

O

OEMI. Original equipment manufacturers' information.

offline. (1) Pertaining to the operation of a functional unit that takes place either independently of, or in parallel with, the main operation of a computer. (T) (2) Neither controlled by, nor communicating with, a computer. Contrast with *online*.

online. (1) Pertaining to the operation of a functional unit when under the direct control of a computer. (T) (2) Pertaining to a user's ability to interact with a computer. (A) (3) Pertaining to a user's access to a computer via a terminal. (A) (4) Controlled by, or communicating with, a computer. Contrast with *offline*.

operating system (OS). Software that controls the execution of programs and that may provide services such as resource allocation, scheduling, input/output control, and data management. Although operating systems are predominantly software, partial hardware implementations are possible. (T)

operator console. (1) A functional unit containing devices that are used for communications between a computer operator and a computer. (T) (2) A display used for communication between the operator and the system, used primarily to specify information concerning application programs and I/O operations and to monitor system operation.

optical fiber. Any filament made of dielectric materials that guides light, regardless of its ability to send signals. (E) See also *fiber optics* and *optical waveguide*.

optical fiber connector . A hardware component that transfers optical power between two optical fibers or bundles and is designed to be repeatedly connected and disconnected.

optical waveguide. (1) A structure capable of guiding optical power. (E) (2) In optical communications, generally a fiber designed to transmit optical signals. See *optical fiber*. See also *cladding, core, fiber optics, multimode optical fiber, optical fiber,* and *single-mode optical fiber*.

option. A specification in a statement that may be used to influence the execution of the statement. A hardware or software function that can be selected or enabled as part of a configuration process. Hardware (such as a network adapter) that can be installed in a device to change or enhance device functions.

OS. Operating system.

OSA. Open systems adapter.

OSA-ICC. Open systems adapter-express integrated console controller.

output device. Synonym for *output unit*.

output unit. A device in a data processing system by which data can be received from the system. (I) (A) Contrast with *input unit*.

P

page. In a virtual storage system, a fixed-length block that has a virtual address and is transferred as a unit between real storage and auxiliary storage. (I) (A)

paging. The transfer of pages between real storage and auxiliary storage. (I) (A)

parallel . (1) Pertaining to a process in which all events occur within the same interval of time, each handled by a separate but similar functional unit; for example, the parallel transmission of the bits of a computer word along the lines of an internal bus. (T) (2) Pertaining to concurrent or simultaneous operation of two or more devices or to concurrent performance of two or more activities in a single device. (A) (3) Pertaining to concurrent or simultaneous occurrence of two or more related activities in multiple devices or channels. (A) (4) Pertaining to the simultaneity of two or more processes. (A) (5) Pertaining to the simultaneous processing of the individual parts of a whole, such as the bits of a character and the characters of a word, using separate facilities for the various parts. (A)

parallel channel. A channel using a System/360™ and System/370™ channel-to-control-unit I/O interface that uses bus-and-tag cables as a transmission medium. | Also, ESCON channel hardware using optical cables as a transmission medium can be connected to a converter to operate as a parallel channel. Contrast with *ESCON channel*.

parameter. (1) A variable that is given a constant value for a specified application and that may denote the application. (I) (A) (2) An item in a menu for which the user specifies a value or for which the system provides a value when the menu is interpreted. (3) Data passed between programs or procedures.

partition. See logical partition and target logical partition.

password. (1) A value used in authentication or a value used to establish membership in a set of people having specific privileges. (2) A unique string of characters known to the computer system, and to a user who must specify it to gain full or limited access to a system and to the information stored within it.

password identifier. In an ESCON Director, a user-defined symbolic name of 24 characters or fewer that identifies the password user.

path. In a network, any route between any two nodes. (T)

PC. Parity check.

PCE. Processor controller.

PCU. Physical control unit.

PER. Program event recording.

PF. Program function.

physical address. The absolute address after configuration (the final address). See also *absolute address, logical address, real address,* and *virtual address*.

physically partitioned (PP) configuration. A system configuration that allows the processor controller to use both processor complex sides as individual processor

complexes. The A-side of the processor controller controls side 0, and the B-side of the processor controller controls side 1. Contrast with *single-image (SI) configuration*.

point-to-point channel path configuration. In an I/O interface, a configuration that consists of a single link between a channel and one control unit. Contrast with *switched point-to-point channel path configuration*.

POR. Power-on reset.

port. (1) An access point for data entry or exit. (2) A receptacle on a device to which a cable for another device is attached. See also *duplex receptacle*.

port address. In an ESCON Director, an address used to specify port connectivity parameters and to assign link addresses for attached channels and control units. See also *link address*.

port address name. In an ESCON Director, a user-defined symbolic name of 24 characters or fewer that identifies a particular port.

POST. Power-on self-test.

power-on reset state. The condition after a machine power-on sequence and before an IPL of the control program.

power-on self-test (POST). A series of tests that are run each time power is switched on.

power/thermal adapter. Hardware that provides the attachment capability for power/thermal stations and allows them to respond to commands from the processor controller.

PP. Physically partitioned (as in configuration).

problem determination (PD). The process of determining the source of a problem; for example, a program component, machine failure, telecommunication facilities, user or contractor-installed programs or equipment, environmental failure such as a power loss, or user error.

processor complex. A system configuration that consists of all the machines required for operation; for example, a processor unit, a processor controller, a system display, a service support display, and a power and coolant distribution unit.

processor controller. Hardware that initializes and provides support and diagnostic functions for the processor unit.

Processor Resource/Systems Manager™ (PR/SM) feature. The feature that allows the processor to use several system control programs (SCPs) simultaneously, provides logical partitioning capability for the real machine, and provides support for multiple preferred guests.

processor storage. The storage available to the central processors (central storage and, if installed, expanded storage).

processor unit. Hardware that consists of one or more central processors, central storage, optional expanded storage, channel subsystem, and system control element.

program function (PF) key. On a keyboard, a key that passes a signal to a program to call for a particular operation.

programming support console. A logical device used as a data bank access console that can be assigned to any of the physical displays attached to the processor controller.

program mode console. A logical device that can be assigned to any of the physical displays attached to the processor controller.

program status word (PSW). An area in storage used to indicate the sequence in which instructions are executed, and to hold and indicate the status of the computer system.

protocol. (1) A set of semantic and syntactic rules that determines the behavior of functional units in achieving communication. (I) (2) In SNA, the meanings of and the sequencing rules for requests and responses used for managing the network, transferring data, and synchronizing the states of network components. (3) A specification for the format and relative timing of information exchanged between communicating parties.

PR/SM. Processor Resource/Systems Manager.

PSW. Program status word.

R

random access memory (RAM) . (1) A storage device in which data can be written and read. (2) A storage device into which data is entered and from which data is retrieved in a nonsequential manner.

RAS. Reliability, availability, serviceability.

RC. Return code.

RCS. Remote control support.

real address. An address before prefixing, such as found in the instruction address portion of the channel status word (CSW). If translation is off, the logical address is the real address. See also *absolute address, logical address, physical address,* and *virtual address.*

REC. Request for engineering change.

reconfiguration. (1) A change made to a given configuration in a computer system; for example,

isolating and bypassing a defective functional unit or connecting two functional units by an alternative path. Reconfiguration is effected automatically or manually and can be used to maintain system integrity. (T) (2) The process of placing a processor unit, main storage, and channels offline for maintenance, and adding or removing components. Contrast with *nondisruptive installation* and *nondisruptive removal.*

recovery. To maintain or regain system operation after a failure occurs. Generally, to recover from a failure is to identify the failed hardware, to deconfigure the failed hardware, and to continue or restart processing.

reference code. See *system reference code*.

register. A part of internal storage having a specified storage capacity and usually intended for a specific purpose. (T)

remote. Synonym for link-attached.

RER. Reformatted error record.

return code. (1) A code used to influence the execution of succeeding instructions. (A) (2) A value returned to a program to indicate the results of an operation requested by that program.

ring network. A network configuration in which devices are connected by unidirectional transmission links to form a closed path.

Note: A ring of an IBM Token-Ring Network is referred to as a LAN segment or as a Token-Ring Network segment.

RMF. Resource Measurement Facility.

row. A horizontal arrangement of data. Contrast with *column*.

R/W. Read/write.

S

SA. (1) System area. (2) Stand-alone.

SAP. System assist processor

saved configuration. In an ESCON environment, a stored set of connectivity attributes whose values determine a configuration that can be used to replace all or part of the ESCD's active configuration. Contrast with *active configuration*.

scalar. (1) A quantity characterized by a single value. (I) (A) (2) A type of program object that contains either string or numeric data. It provides representation and operational characteristics to the byte string to which it is mapped. (3) Pertaining to a single data item as opposed to an array of data items. Contrast with *vector*.

scan. An operation that writes data to or reads data from functional elements through shift register latches arranged in scan rings.

SCH. Subchannel.

SCP. System control program.

screen. See *display screen*.

scroll. To move a display image vertically or horizontally to display data that cannot be observed within the boundaries of the display frame.

SE. Support element.

SEC. System engineering change.

selector channel . An I/O channel designed to operate with only one I/O device at a time. After the I/O device is selected, a complete record is transferred 1 byte at a time. Contrast with *byte multiplexer channel*. See also *block multiplexer channel*.

service console. A logical device used by service representatives to maintain the processor complex and to isolate failing field-replaceable units (FRUs). The service console can be assigned to any of the physical displays attached to the processor controller.

service representative. A person who performs maintenance services for IBM hardware products or systems. See also *IBM program support representative*.

service support display . A display station attached to a port of the processor controller and required for service support. See also *system display*.

session. In SNA, a logical connection between two network addressable units (NAUs) that can be activated, tailored to provide various protocols, and deactivated as requested.

shift register latch. Logic that operates either in parallel for normal (register-to-register) data flow or serially (from the high-order to low-order positions) during a scan operation.

SI. Single-image configuration.

simulation. The use of a data processing system to represent selected behavioral characteristics of a physical or abstract system; for example, the representation of air streams around airfoils at various velocities, temperatures, and air pressures. Contrast with *emulation*.

single-image configuration. A system configuration that allows the processor controller to use one processor complex side while the other side is available as a backup. The A-side or B-side becomes the operational processor complex, the remaining side becomes the backup, and all the functional elements can be activated.

single-mode optical fiber. An optical fiber in which only the lowest-order bound mode (which can consist of a pair of orthogonally polarized fields) can propagate at the wavelength of interest. (E) Contrast with *multimode optical fiber*.

SLC. Service language command.

SNA. Systems Network Architecture.

soft error. (1) An error that occurs sporadically and that may not appear on successive attempts to read data. (T) (2) An intermittent error on a network that requires retransmission. Contrast with *hard error*.

Note: A soft error by itself does not affect overall reliability of the network, but reliability may be affected if the number of soft errors reaches the ring error limit.

SP. Service processor.

S/R. Send/receive.

standard. Something established by authority, custom, or general consent as a model or example.

station. (1) An input or output point of a system that uses telecommunication facilities; for example, one or more systems, computers, terminals, devices, and associated programs at a particular location that can send or receive data over a telecommunication line. (2) A location in a device at which an operation is performed; for example, a read station. (3) In SNA, a link station.

STI. Self-Timed Interface.

storage. (1) A functional unit into which data can be placed, in which they can be retained, and from which they can be retrieved. (T) (2) The action of placing data into a storage device. (I) (A)

storage control. In a DASD subsystem, the component that connects the DASD to the host channels, performs channel commands, and controls the DASD devices. For example, the 3990 Model 2 and Model 3 are storage controls.

storage director. In a 3990 Storage Control, a logical entity consisting of one or more physical storage paths in the same storage cluster. In a 3880 Storage Control, a storage director is equal to a storage path.

storage subsystem. A storage control and its attached storage devices.

subchannel. In ESA/390 mode, the facility that provides all of the information necessary to start, control, and complete an I/O operation.

subchannel number. A system-unique 16-bit value used to address a subchannel. See also *channel path identifier, device identifier,* and *device number*.

subsystem. A secondary or subordinate system, or programming support, usually capable of operating independently of or asynchronously with a controlling system. (T) See *DASD subsystem* and *storage subsystem*.

support element (SE). A hardware unit that provides communications, monitoring, and diagnostic functions to a central processor complex (CPC).

switched point-to-point channel path configuration. In an ESCON I/O interface, a configuration that consists of a link between a channel and an ESCON Director and one or more links from the ESCD, each of which attaches to a control unit. This configuration depends on the capabilities of the ESCD for establishing and removing connections between channels and control units. Contrast with *point-to-point channel path configuration*.

SYSGEN . System generation.

SYSIML. System initial machine load.

SYSIN. System input.

SYSLOG . System log.

SYSOUT. System output.

SYSRESET . System reset.

system configuration. A process that specifies the devices and programs that form a particular data processing system.

system console. (1) A console, usually having a keyboard and a display screen, that is used by an operator to control and communicate with a system. (2) A logical device used for the operation and control of hardware functions (for example, IPL, alter/display, and reconfiguration). The system console can be assigned to any of the physical displays attached to the processor controller.

system control element (SCE). Hardware that handles the transfer of data and control information associated with storage requests between the elements of the processor.

system control programming (SCP). IBM-supplied programming that is fundamental to the operation and maintenance of the system. It serves as an interface with licensed programs and user programs and is available without additional charge.

system display. A display station that attaches to a port of the processor controller and is required for normal system operation. See also *service support display*.

system generation (SYSGEN). The process of selecting optional parts of an operating system and of

creating a particular operating system tailored to the requirements of a data processing installation. (I) (A)

system log. (SYSLOG) A data set or file in which job-related information, operational data, descriptions of unusual occurrences, commands, and messages to or from the operator are stored.

system reference code. A code that contains information, such as a failing field-replaceable unit, for a service representative.

system reset (SYSRESET). To reinitialize the execution of a program by repeating the initial program load (IPL) operation.

system resource. Hardware, such as a central processor, I/O devices, channel paths, software programs, or other components that contribute to system operation. See also *critical resource*.

Systems Network Architecture (SNA) . The description of the logical structure, formats, protocols, and operational sequences for transmitting information units through, and controlling the configuration and operation of, networks.

T

target logical partition. In LPAR mode, the current or immediate logical partition being used or displayed. It is identified on the status line and determined by the SETLP service language command.

target processor. The processor that controls execution during a program restart, instruction trace, stand-alone dump, or IPL, and whose ID is identified by highlighting on the status line.

tera. Ten to the twelfth power, 1 000 000 000 000 in decimal notation. When referring to storage size, 2 to the fortieth power, 1 009 511 627 776 in decimal notation.

terminal. (1) A functional unit in a system or communication network at which data may enter or leave. (T) (2) A point in a system or communication network at which data can either enter or leave. (A) (3) In data communication, a device, usually having a keyboard and display device, capable of sending and receiving information. See also *display station* and *workstation*.

thermal conduction module (TCM). A field-replaceable unit (FRU) that has multiple logic modules containing level-sensitive scan design logic.

time-of-day (TOD) clock. A system hardware feature that is incremented once every microsecond, and provides a consistent measure of elapsed time suitable for indicating date and time. The TOD clock runs regardless of whether the processor is in a running, wait, or stopped state.

timeout. (1) An event that occurs at the end of a predetermined period of time that began at the occurrence of another specified event. (I) (2) A time interval allotted for specific operations to occur; for example, response to polling or addressing before system operation is interrupted and must be restarted. (3) A terminal feature that logs off a user if an entry is not made within a specified period of time.

token. A sequence of bits passed from one device to another on the token-ring network that signifies permission to transmit over the network. It consists of a starting delimiter, an access control field, and an end delimiter. The access control field contains a bit that indicates to a receiving device that the token is ready to accept information. If a device has data to send along the network, it appends the data to the token. When data is appended, the token then becomes a frame.

token-ring network. (1) A ring network that allows unidirectional data transmission between data stations, by a token passing procedure, such that the transmitted data return to the transmitting station. (T) (2) A network that uses ring topology, in which tokens are passed in a circuit from node to node. A node that is ready to send can capture the token and insert data for transmission.

Note: The IBM Token-Ring Network is a baseband LAN with a star-wired ring topology that passes tokens from network adapter to network adapter.

TPF. Transaction processing facility.

trace. (1) A record of the execution of a computer program. It exhibits the sequences in which the instructions were executed. (A) (2) A record of the frames and bytes transmitted on a network.

transmission frame. In data transmission, data transported from one node to another in a particular format that can be recognized by the receiving node. In addition to a data or information field, a frame has some kind of delimiter that marks its beginning and end and usually control fields, address information that identifies the source and destination, and one or more check bits that allow the receiver to detect any errors that may occur after the sender has transmitted the frame.

TSO. Time sharing option.

U

unit address. The last two hexadecimal digits of a device number or a value specified for a device.

Note: Often used interchangeably with control unit address and device address in System/370 mode
.

V

variable. (1) In programming languages, a language object that may take different values, one at a time. The values of a variable are usually restricted to a certain data type. (I) (2) A quantity that can assume any of a given set of values. (A) (3) A name used to represent a data item whose value can be changed while the program is running.

VE. Vector element.

vector. (1) A quantity usually characterized by an ordered set of numbers. (I) (A) (2) A one-dimensional array. Contrast with *scalar*.

virtual address. The address of a location in virtual storage. A virtual address must be translated into a real address to process the data in processor storage. See also *absolute address, logical address, physical address*, and *real address*.

virtual machine (VM). (1) A virtual data processing system that appears to be at the exclusive disposal of a particular user, but whose functions are accomplished by sharing the resources of a real data processing system. (T) (2) A functional simulation of a computer system and its associated devices, multiples of which can be controlled concurrently by one operating system.

virtual storage (VS). (1) The storage space that may be regarded as addressable main storage by the user of a computer system in which virtual addresses are mapped into real addresses. The size of virtual storage is limited by the addressing scheme of the computer system and by the amount of auxiliary storage available, not by the actual number of main storage locations. (I) (A) (2) Addressable space that is apparent to the user as the processor storage space, from which the instructions and the data are mapped into the processor storage locations.

VM. Virtual machine.

VS. Virtual storage.

VSE. Virtual storage extended.

VTAM. Virtual telecommunications access method.

W

warning message. An indication that a possible error has been detected. See also *error message* and *information message*.

workstation. (1) A functional unit at which a user works. A workstation often has some processing capability. (T) (2) A terminal or microcomputer, usually one that is connected to a mainframe or network, at which a user can perform applications. See also *display station* and *terminal*.

WP. Write protect.

X

X X.25 . In data communication, a recommendation of the CCITT that defines the interface between data terminal equipment and packet switching networks.

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