IBM

System z

ESCON and FICON Channel-to-Channel Reference

SB10-7034-05

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SB10-7034-05

Note

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This edition, SB10-7034-05 applies to the IBM® System z™ processors, and replaces SB10-7034-04.

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Contents

Safety and environmental notices

Safety notices

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About this publication

This publication describes the Enterprise Systems Connection (ESCON™) Channel-to-Channel adapter and the Fibre Connection (FICON™) Channel-to-Channel adapter. A technical change to the text or illustration is indicated by a vertical line to the left of the change.

- ESCON has the channel-to-channel adapter function implemented and integrated into its licensed internal code.
- FICON allows a Fibre Channel channel path to function as both a channel and a Channel-to-Channel (CTC) simultaneously.

What is included in this publication

This publication contains the following:

- Chapter 1, "ESCON channel-to-channel introduction" is an introduction of the ESCON channel-to-channel function.
- Chapter 2, "Using IOCP to define an ESCON CTC configuration" describes how to define an ESCON channel-to-channel configuration.
- Chapter 3, "ESCON CTC support for parallel CTC basic mode" describes the basic channel-to-channel architectures and parallel channel-to-channel basic mode support.
- Chapter 4, "ESCON CTC device-specific functions" describes the device specific functions for the ESCON channel-to-channel function.
- Chapter 5, "Recommendations for numbering CTC control units and devices"describes a methodology for choosing control unit numbers and device numbers for CTC configuration.
- Chapter 6, "FICON channel-to-channel introduction" is an introduction of the FICON channel-to-channel function.
- Chapter 7, "Using IOCP to define a FICON CTC configuration"describes how to define a FICON channel-to-channel configuration.
- Chapter 8, "FICON CTC device-specific functions"describes the device specific functions for the FICON channel-to-channel function.
- Appendix A, "ESCON configuration examples" describes and illustrates the ESCON CTC configurations, including IOCP statements.
- Appendix B, "FICON configuration examples"describes and illustrates FICON CTC configurations, including IOCP statements.
- Appendix C, "Notices"contains standard IBM information relative to this publication and Trademarks.
- Glossary defines terms and abbreviations used in this publication.
- Index

Related publications

The following publications contain information on topics related to IOCP.

z/VM®

- *z/VM General Information*, GC24-5944, describes the features of z/VM®.

z/VSE™

- *z/VSE Planning*, SC33-8221, provides information on how to set up z/VSE® on a managed system.

Input/Output configuration program

- *IOCP User's Guide for IYP IOCP*, SB10-7029
- *IOCP User's Guide for ICP IOCP*, SB10-7037

IBM Enterprise Systems Connection (ESCON)

- *Introducing Enterprise Systems Connection*, GA23-0383
- *ESCON Director Introduction*, GA23-0363
- *Planning for the 9032 ESCON Director*, GA23-0364

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Chapter 1. ESCON channel-to-channel introduction

CTC communication and connection

The channel-to-channel (CTC) adapter is an input/output (I/O) device that is normally used by a program in one system to communicate with a program in another system. A CTC *communication* is established between two programs when the adapter is selected to respond to channel-command words (CCWs) that are issued by the two channels the CTC adapter connects.

A CTC *connection* is set up between two channels when two channels are individually configured to a CTC adapter.

Parallel I/O CTC configuration

In the parallel I/O interface environment, a stand-alone adapter (for example, the IBM 3088 Multisystem Channel Communication Unit) is used to interconnect channels. An internal switching mechanism in 3088 allows any attached channel to connect to other attached channels. See Figure 1.

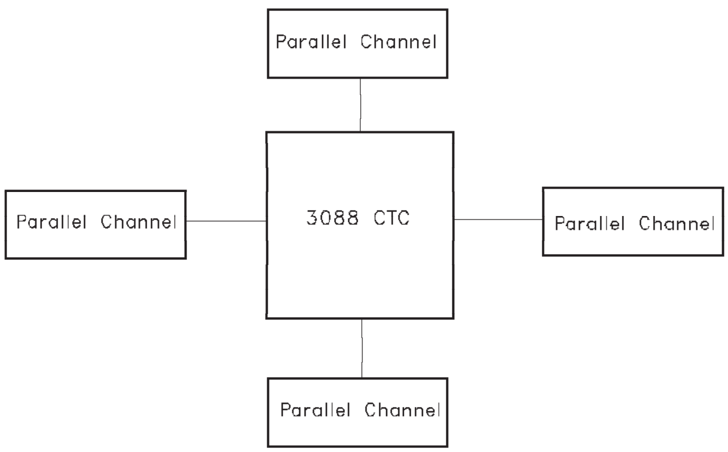

Figure 1. CTC configuration with parallel I/O interface

ESCON I/O CTC configuration

In the Enterprise Systems Connection (ESCON) I/O interface environment, a stand-alone CTC adapter unit is no longer used to provide the switching function. This is now provided by the ESCON Director. CTC connections between channels can be made by going through the ESCON Director without a stand-alone CTC adapter. See Figure 2 on page 3. The CTC adapter function without the switching mechanism still needs to be implemented logically between connecting channels. That function is now in the ESCON CTC channel. For more detail see "ESCON CTC channel" on page 3.

The ESCON channels in Figure 2 on page 3 are represented in general terms. They can be either CTC, CNC, or FCV channels. An ESCON CNC or FCV channel is an ESCON channel that can communicate with any ESCON control unit. An ESCON CTC channel is an ESCON channel that can only communicate with a CNC or FCV channel.

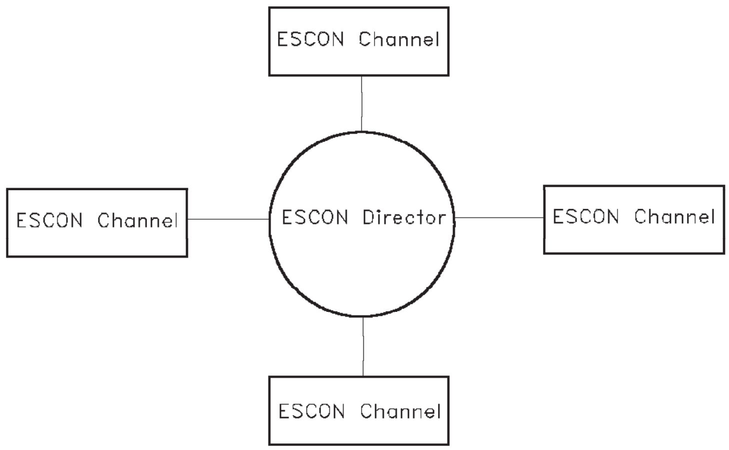

Figure 2. Using ESCON director for channel-to-channel switching

ESCON CTC channel

An ESCON CTC channel is an ESCON channel that has the CTC adapter function implemented and integrated in its Licensed Internal Code (LIC). An ESCON CTC channel can be logically divided into two sections:

- Channel section

  The channel section performs the regular channel functions.
- CTC control unit section

  The CTC control unit section synchronizes the operations performed between two channels. See *ESA/390: ESCON Channel-to-Channel Adapter*, SA22-7203, for more information.

Both the ESCON CTC channel and ESCON CNC channel use the same ESCON channel hardware, but different Licensed Internal Code (LIC). The channel designation is set by the TYPE keyword in the IOCP CHPID statement. The ESCON FCV channel uses FICON™ channel hardware and attaches to an ESCON Director which converts the channel to an ESCON channel. An FCV channel is capable of communicating with any ESCON control unit or an ESCON CTC channel path.

A virtual link exists between the channel section and the CTC control unit section. Logically a CTC control unit exists between its own channel section and the CNC or FCV channel it is connected to by the ESCON I/O interface. The CTC channel acts like a control unit, not a channel, on the ESCON I/O interface to the connected CNC or FCV channels. See Figure 3 on page 4.

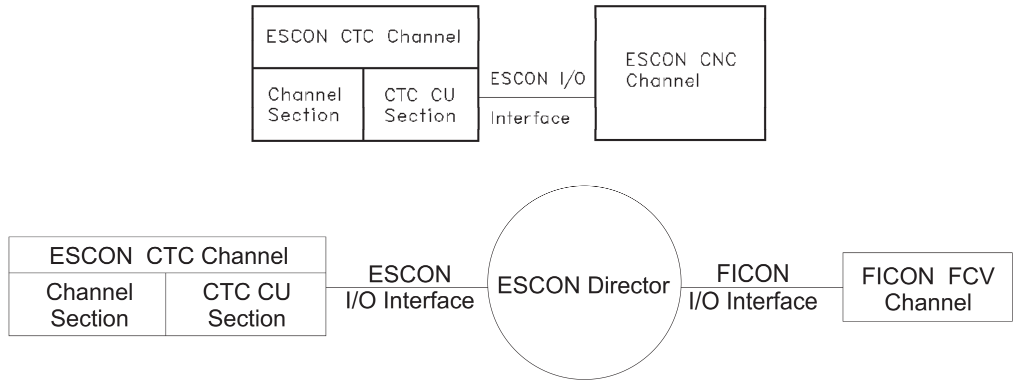

Figure 3. ESCON CTC channel structure

The following general rules for CTC connections apply to Figure 4:

- A CTC connection requires an ESCON CTC channel at one end of the connection and an ESCON CNC or FCV channel at the other end of the connection. A CTC connection supports bidirectional CTC communications. A CTC channel and a CNC or FCV channel in a CTC connection can send information to each other.
- The CTC channel can be connected to a CNC channel point-to-point or by a static connection using an ESCON Director. It can be connected to multiple CNC or FCV channels by dynamic connections using an ESCON Director.
- A CTC channel cannot form a CTC connection with another CTC channel because two CTC control unit sections cannot communicate over an ESCON I/O interface.
- A CNC or FCV channel cannot form a CTC connection with another CNC or FCV channel. The CTC control unit functions in a CTC channel cannot be used to connect two CNC or FCV channels attached to the same ESCON Director.
- The CTC channel is dedicated exclusively to CTC operations. It can be connected only to CNC or FCV channels, not to any other ESCON I/O control units.
- The CNC or FCV channel in a CTC connection can be configured to access other CTC channels and other ESCON I/O control units attached to the same ESCON Director.

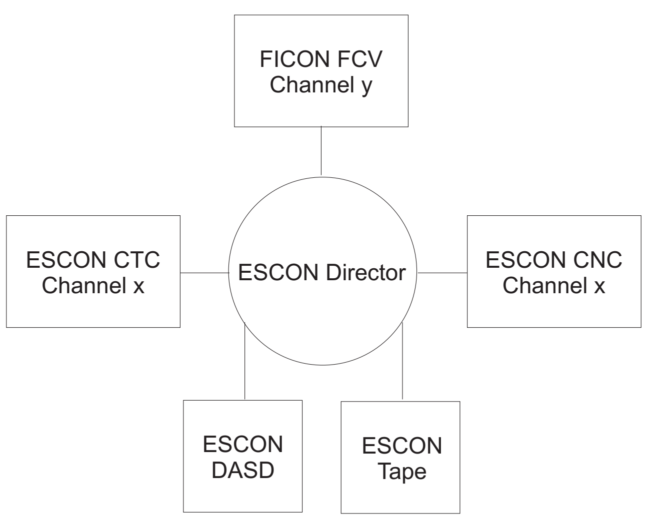

Figure 4. ESCON CTC channel configuration with an ESCON cirector

- CTC channel x and CNC channel x can form a CTC connection.
- CTC channel x and FCV channel y can form a CTC connection.
- CNC channel x and FCV channel y cannot form a CTC connection.
- CNC channel x and FCV channel y can access other ESCON I/O control units (for example: ESCON DASD and ESCON Tape as shown in Figure 4 on page 4).

Unshared channel

Channels in a processor complex without multiple image facility (MIF) capability cannot be shared by PR/SM™™ logical partitions. Unshared channels are dedicated to a single partition in LPAR mode or are on a processor running in basic mode. If an unshared channel is reconfigurable, it can be deconfigured from one partition and reconfigured to another partition.

Channels at either or both ends of a CTC connection can be shared or unshared.

Shared channel

The multiple image facility (MIF) allows PR/SM™ logical partitions to share channel paths. If a processor complex has MIF capability and is running in LPAR mode, its logical partitions can share channel paths to reduce the number of physical connections between processor complexes. CTC, CNC, and FCV channels can be defined as shared channels. See Figure 5.

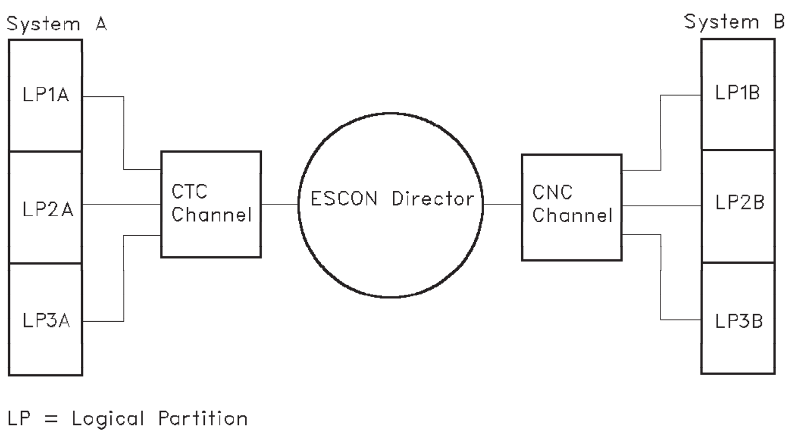

Figure 5. CTC connection with shared channels

Channels in a MIF-capable processor complex can be shared or unshared based on the CHPID statement designation in the IOCP input.

ESCON CTC control unit

The CTC control unit section in an ESCON CTC channel can consist of multiple CTC control units. A CTC control unit is a two-sided control unit. One side is virtually connected to the channel section of the CTC channel. The other side is connected to a CNC or FCV channel on an ESCON interface. Each side is configured individually to its corresponding channel as a CTC control unit and is accessed independently by its corresponding channel. Each separately configured control unit represents one side of a two-sided CTC control unit in the CTC channel. See Figure 6 on page 6.

1. When an unshared CTC channel is connected to an unshared CNC or FCV channel, only one CTC control unit can be configured for the CTC connection. The two-sided control unit is used between the partitions owning the CTC channel and the CNC or FCV channel.

   In Figure 6 on page 6, the CTC control unit 1 is configured for the CTC connection between CTC channel x and CNC channel x. CTC control unit 2 is configured for the CTC connection between CTC channel x and CNC channel y. CTC control unit 3 is configured for the CTC connection between CTC channel x and FCV channel z.

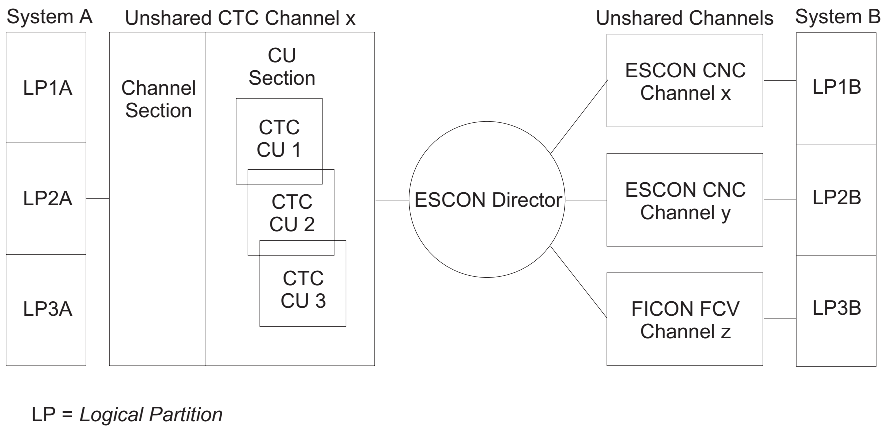

Figure 6. Unshared CTC channel to unshared CNC and FCV channels

2. When an unshared CTC channel is connected to a shared CNC or FCV channel, a two-sided CTC control unit can be configured between the partition owning the CTC channel and each partition sharing the CNC or FCV channel.

   In Figure 7, three CTC control units can be configured between LP2A in System A and each partition in System B.

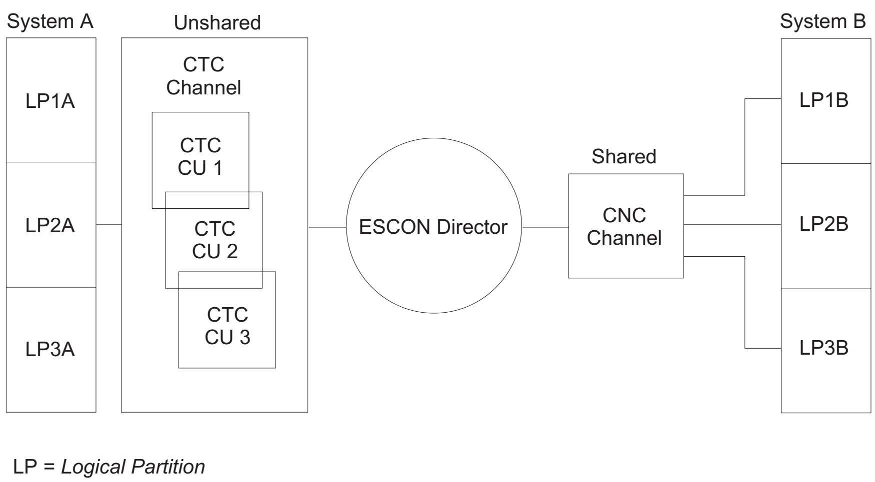

Figure 7. Unshared CTC channel to shared CNC channel

3. When a shared CTC channel is connected to an unshared CNC or FCV channel, a two-sided CTC control unit can be configured between each partition sharing the CTC channel and the partition owning the CNC or FCV channel.

   In Figure 8 on page 7, three CTC control units can be configured between each partition in System A and LP2B in System B.

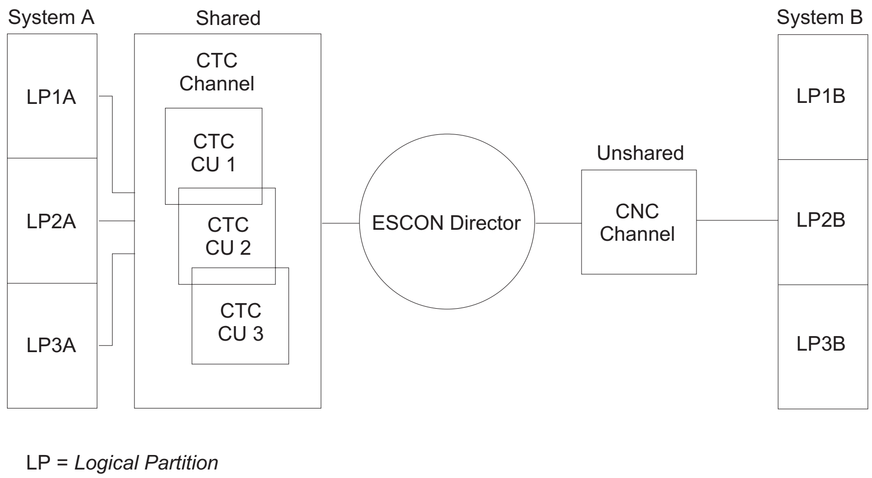

Figure 8. Shared CTC channel to unshared CNC channel

4. When a shared CTC channel is connected to a shared CNC or FCV channel, a two-sided CTC control unit can be configured between each partition sharing the CTC channel and each partition sharing the CNC or FCV channel

   In Figure 9, nine (3x3) CTC control units can be configured for the CTC connection between system A and system B.

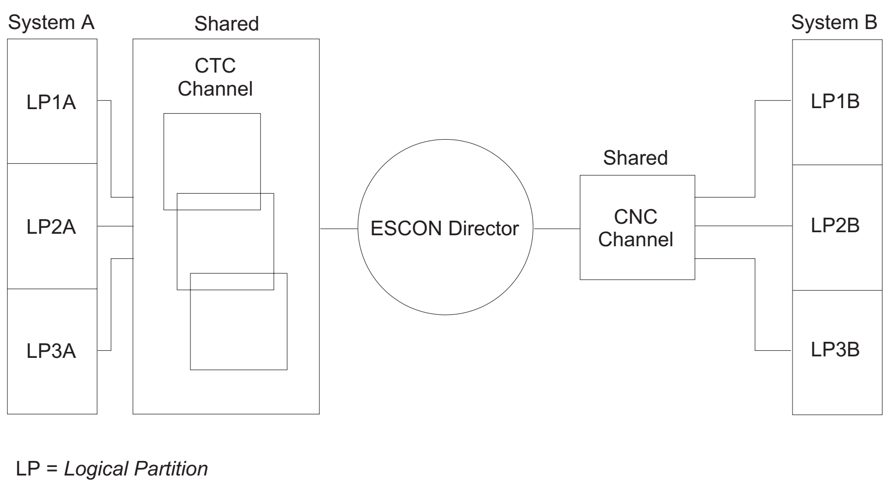

Figure 9. Shared CTC channel to shared CNC channel

ESCON CTC device

Multiple CTC devices can be configured to a CTC control unit after the CTC control unit is defined.

An ESCON CTC device is a two-sided device. It provides the data path and synchronization for data transfer between the two channels it connects. Each side is configured individually to its corresponding channel as a CTC device and is accessed independently by its corresponding channel. Each separately configured CTC device represents one side of a two-sided CTC device in the CTC channel. **Both sides of the CTC device must have the same unit address defined in IOCP**.

Each two-sided CTC device is capable of supporting a CTC communication between two programs. There can be multiple CTC communications in progress between a CTC channel and the CNC or FCV channels it connects. The ESCON Director can establish only one dynamic connection at a given time between the CTC channel port and one of the CNC or FCV channel ports. Only one CTC communication can be active on the CTC channel's ESCON I/O interface at any given time. During this time, other CTC communications in progress are disconnected from the channel interface with channel programs in a command-disconnected state.

Chapter 2. Using IOCP to define an ESCON CTC configuration

ESCON CTC configurations

The ESCON CTC channel implements CTC control units and devices within the channel. The conventional method of configuring a stand-alone control unit (for example the IBM 3088 Multisystem Channel Communication Unit) no longer applies to ESCON CTC. This chapter describes the methods of defining ESCON CTC configurations to the Input/Output Configuration Program (IOCP). See Appendix A, “ESCON configuration examples,” on page 59 for IOCP deck examples.

Hardware configuration definition (HCD) can also be used for defining ESCON CTC configurations. Rules and recommendations described in this document are applicable. See the chapter on I/O Statements and Functions in the *IOCP User's Guide for IYP IOCP*.

The numbering scheme used in this chapter and the ESCON configuration examples in Appendix A for control unit and device numbers is for illustration purposes only. This numbering scheme may not be suitable for all CTC configurations. The first 2 digits of the number are the channel *chpid* number to which the control unit and device are defined. The third digit is an installation-assigned unique number X'0' to X'F' for the destination partition at the other end of a CTC connection. Each logical partition in the CTC configuration is assigned a unique number. In this document, the logical partition number is used as the assigned number. The fourth digit is set to zero. See Chapter 5, "Recommendations for Numbering CTC Control Units and Devices" for an alternative methodology that is recommended for choosing control unit numbers and device numbers for CTC configurations.

A CTC wraparound connection is a connection where the two channels are in the same processor complex. It is used for CTC communications across logical partitions in the same processor complex.

Peer-to-peer

When defining ESCON CTC control units and devices to the CNC or FCV channel, CTC control units, as described in "ESCON CTC Channel" on page 1-3, are considered to be located within the CTC channel at the other end of a CTC connection.

When defining ESCON CTC control units and devices to the CTC channel, the integrated CTC control unit implementation is no longer perceived to be within the CTC channel. Instead, IOCP views the CTC control units and devices to be within the CNC or FCV channel at the other end of a CTC connection.

From the viewpoint of IOCP, the two channels in a CTC connection can be considered as communicating directly with each other in a peer-to-peer fashion, without the integrated CTC control units in between. With unshared channels, each channel defines a CTC control unit for the channel at the other end of a CTC connection. With shared channels, each channel defines a CTC control unit for each partition which shares the channel at the other end of a CTC connection.

Configuration limits

An ESCON CTC channel supports up to 120 two-sided CTC control units and 512 two-sided CTC devices. A maximum of 256 ESCON CTC devices can be configured to a CTC control unit. The number of configured CTC control units in a shared CTC channel may be greater than the number of CNTLUNIT statements that are defined to the CTC channel. See “MIF-to-MIF configurations” on page 14 for more details.

Non-MIF-to-non-MIF configurations

Channels in a non-MIF-capable (Multiple Image Facility) processor complex are configured to one logical partition in LPAR mode. They are not shared by PR/SM logical partitions.

This section describes how to define ESCON CTC configurations to the IOCP when both ends of a CTC connection are unshared channels. Figure 10 is referenced throughout the following IOCP statement examples. CTC channel *chpid* 50 is configured to logical partition 1A in System A. CNC channel *chpid* 60 is configured to logical partition 1B in System B.

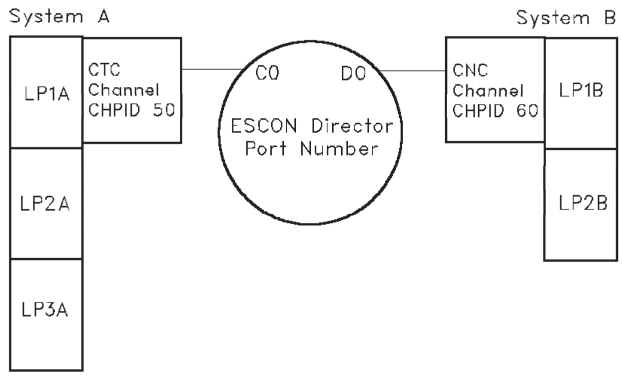

Figure 10. Non-MIF-to-non-MIF configuration

Defining CHPIDs

Code the *chpid* number as the PATH keyword. Code the TYPE keyword as CTC, CNC, or FCV depending on the type of channel. If the connection is by means of an ESCON Director, specify a number on the SWITCH keyword.

The following CHPID statement example defines CTC channel *chpid* 50 in System A:

```
CHPID PATH=50,TYPE=CTC,PART=LP1A,SWITCH=01
```

The following CHPID statement example defines shared CNC channel *chpid* 60 in System B:

```
CHPID PATH=60,TYPE=CNC,PART=LP1B,SWITCH=01
```

Defining CTC control units

Each channel considers the channel at the other end of a CTC connection (whether a CTC, CNC, or FCV channel) to be a CTC control unit.

- If the CTC connection is through an ESCON Director dynamic connection, specify the port address of the channel at the other end of the CTC connection as the LINK keyword in the CNTLUNIT statement for that channel.
- If the CTC connection is either point-to-point or through an ESCON Director static connection, the LINK keyword in the CNTLUNIT statement is optional. If you do code it and the CNTLUNIT statement is associated with a CTC *chpid*, a different value must be assigned as the CNC channel link address at the other end of the CTC connection.

Control unit type keyword UNIT must be coded as SCTC for proper IOCP verification and checking.

```
CNTLUNIT CUNUMBR=5010,PATH=50,LINK=D0,UNITADD=((40,8)),UNIT=SCTC
```

For the two channels of a CTC connection, define each channel as a CTC control unit to the other channel. The two corresponding but separately defined control units (one in each IOCP input file) make up a two-sided control in the CTC channel implementation. The following example shows control unit 5010 that is defined to System A and control unit 6010 that is defined to System B make up a corresponding pair of control units.

```
CNTLUNIT CUNUMBR=5010,PATH=50,LINK=D0,UNITADD=((40,8)),UNIT=SCTC
CNTLUNIT CUNUMBR=6010,PATH=60,LINK=C0,UNITADD=((40,8)),UNIT=SCTC
```

When a CTC channel is configured to CNC or FCV channels through ESCON Director dynamic connections, each CNC or FCV channel is defined as a separate control unit to the system hosting the CTC channel, whether or not the CNC or FCV channel is in the same processor complex as the CTC channel.

When a CNC or FCV channel is configured to CTC channels through ESCON Director dynamic connections, each CTC channel is defined as a separate control unit to the system hosting the CNC or FCV channel.

Defining CTC devices

When defining the IODEVICE statement, associate each device number with a CTC device.

The following IODEVICE statement example defines 8 CTC devices to the above control unit number 5010 in System A:

```
IODEVICE ADDRESS=(5010,8),CUNUMBR=5010,UNITADD=40,UNIT=SCTC
```

The following IODEVICE statement example defines 8 CTC devices to the preceding control unit number 6010 in System B:

```
IODEVICE ADDRESS=(6010,8),CUNUMBR=6010,UNITADD=40,UNIT=SCTC
```

The CTC devices associated with the corresponding pair of CTC control units form corresponding pairs of CTC devices. A pair of corresponding CTC devices in the IOCP input files make up a two-sided CTC device in the CTC channel implementation. The corresponding pair of CTC devices from 2 systems can have different device numbers, but they must have the same unit address. For example, with the above IODEVICE statements, CTC device 5010 (unit address 40) of System A corresponds to CTC device 6010 (unit address 40) of System B.

A corresponding pair of CTC devices (a two-sided CTC device implementation in the CTC channel) can support a CTC communication between two programs.

Redundant CTC configuration

Minimum configuration

When using a single ESCON Director, the minimum number of CTC, CNC, or FCV channels required to allow any partition to communicate with any other partition is:

```
CTC channels = (n-1)        CNC or FCV channels = (n-1)
      where n = number of systems in basic mode
                or number of logical partitions in LPAR mode
```

See Figure 27 on page 64

Channel-redundant configuration

The minimum configuration does not provide for alternative paths. The availability of a CTC communication, in the event of a single channel or ESCON Director port failure, can be increased by defining a CTC and a CNC or FCV channel for each partition. The number of CTC, CNC, or FCV channels required to allow any partition to communicate with any other partition is:

```
CTC channels = n        CNC or FCV channels = n
      where n = number of systems in basic mode
                or number of logical partitions in LPAR mode
```

See Figure 29 on page 69.

Fully redundant configuration

The previous channel redundant configuration does not provide for ESCON Director failure. Full redundancy can be achieved with two ESCON Directors, each supporting a minimum CTC configuration. The number of CTC, CNC, and FCV channels required to allow any partition to communicate with any other partition is:

```
CTC channels = 2x(n-1)        CNC or FCV channels = 2x(n-1)
      where n = number of systems in basic mode
                or number of logical partitions in LPAR mode
```

See Figure 30 on page 71.

MIF-to-MIF configurations

Channels in a MIF (Multiple Image Facility) processor complex can be shared or unshared based on the *chpid* specification in the IOCP input file.

An unshared channel (CTC, CNC, or FCV channel) is defined by the IOCP like a channel in a non-MIF-capable processor. For example, when defining a CNTLUNIT statement representing an unshared channel at the other end of a CTC connection, either code the CUADD keyword as zero or do not code it. See "Non-MIF-to-MIF configurations" on page 18.

This section describes how to define ESCON CTC configurations to IOCP when both ends of a CTC connection are shared channels. Figure 11 is referenced throughout the following IOCP statement examples. CNC channel *chpid* 50 and CTC channel *chpid* 51 are shared respectively by partitions 1A, 2A, and 3A in System A. CNC Channel *chpid* 60 and CTC channel *chpid* 61 are shared respectively by partitions 5B and 6B in System B.

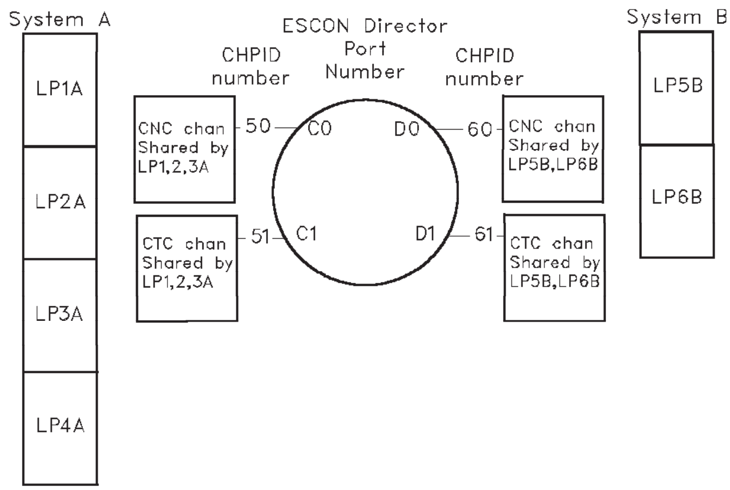

Figure 11. MIF-to-MIF configuration

The terms ***source*** and ***destination*** are used in this document to indicate two ends of a CTC connection. When you define CTC control units and devices to the system at one end (source) of a CTC connection, the other end of the CTC connection is referred to as the destination. A CTC connection supports bidirectional CTC communications. The CTC, CNC, and FCV channels of a CTC connection can be viewed as both source and destination depending on which end is the connection being defined.

Defining CHPIDs

Code the *chpid* number as the PATH keyword. Code the TYPE keyword as CTC, CNC, or FCV depending on the type of channel. If the connection is by means of an ESCON Director, specify a number on the SWITCH keyword.

The following RESOURCE and CHPID statement example defines CTC channel *chpid* 51 in System A:

```
RESOURCE PARTITION=((LP1A,1),(LP2A,2),(LP3A,3),(LP4A,4))
CHPID PATH=51,TYPE=CTC,SWITCH=01,PART=(LP1A,LP2A,LP3A)
```

The following RESOURCE and CHPID statement example defines CNC channel *chpid* 60 in System B:

```
RESOURCE PARTITION=((LP5B,5),(LP6B,6))
CHPID PATH=60,TYPE=CNC,SWITCH=01,PART=(LP5B,LP6B)
```

Defining CTC control units

When you define CTC control units, each partition sharing the channel (CTC, CNC, or FCV channel) at the destination end of a CTC connection is considered by the channel on the source end as a separate control unit. The partition number or MIF image ID of the destination partition is specified by the CUADD keyword. If the channel at the destination end is not shared, do not code the CUADD keyword, or code it as zero.

- If the CTC connection is through an ESCON Director dynamic connection, specify the port address of the channel at the other end of the CTC connection as the LINK keyword in the CNTLUNIT statement for that channel.
- If the CTC connection is either point-to-point or through an ESCON Director static connection, the LINK keyword in the CNTLUNIT statement is optional. If you do code it and the CNTLUNIT statement is associated with CTC *chpid*, a different value must be assigned as the CNC channel link address at the other end of the CTC connection.

Control unit type keyword UNIT must be coded as SCTC for proper IOCP verification and checking.

The following CNTLUNIT statement example defines a CTC control unit representing destination partition LP5B (sharing *chpid* 60 in System B) to *chpid* 51 in System A:

```
CNTLUNIT CUNUMBR=5150,PATH=51,LINK=D0,CUADD=5,UNITADD=((40,6)),UNIT=SCTC
```

The following CNTLUNIT statement example defines a CTC control unit representing destination partition LP1A (sharing *chpid* 51 in System A) to *chpid* 60 in System B:

```
CNTLUNIT CUNUMBR=6010,PATH=60,LINK=C1,CUADD=1,UNITADD=((40,6)),UNIT=SCTC
```

Unlike other types of control units, the CTC control unit specified by a CNTLUNIT statement cannot be shared among source logical partitions. When you define a CNTLUNIT statement to a CTC channel shared by multiple partitions, the CTC control unit representing the destination partition is internally replicated into multiple pseudo control units in the CTC channel. One control unit is created for each source partition specified in the RESOURCE statement (not based on the PARTITION keyword on the CHPID statement).

If the RESOURCE statement is not specified, the replication is based on the partitions on the number of defined source partitions in the I/O configuration. For control unit number 5150, four pseudo control units are created as a result of the CNTLUNIT statement. For control unit number 6010, two pseudo control units are created as a result of the CNTLUNIT statement.

When a CNTLUNIT statement is defined to a shared channel, a pseudo control unit is created between each of the source partitions and the destination partition represented by the CNTLUNIT statement. If the source partitions specified on the RESOURCE statement do not require CTC communications with the destination partition represented by the CNTLUNIT statement, the PARTITION keyword on the associated IODEVICE statements can be used to include only those source partitions requiring CTC communications. Pseudo control units are created only for those partitions. See “Defining CTC devices” on page 16 for more details.

Between the source and the destination partitions of the two shared channels of a CTC connection, the pseudo control unit created by one end and the separate pseudo control unit created by the other end make up a corresponding pair of pseudo control units (a two-sided CTC control unit). With the above IOCP examples, a pseudo control unit created from control unit number 5150 for LP1A to LP5B and a separate pseudo control unit created from control unit number 6010 for LP5B to LP1A make up a corresponding pair of pseudo control units.

Note that control unit number 6010 does not create a pseudo control unit for LP5B to LP2A. To make up a two-sided control unit between LP2A and LP5B, a pseudo control unit, created from the following CNTLUNIT statement in System B, is required to correspond to a separate pseudo control unit created from control unit number 5150:

```
CNTLUNIT CUNUMBR=6020,PATH=60,LINK=C1,CUADD=2,UNITADD=((40,6)),UNIT=SCTC
```

A CTC channel can support up to 120 two-sided CTC control units. For a shared CTC channel, a corresponding pair of pseudo control units make up a two-sided CTC control unit. It is strongly recommended to use the PARTITION keyword on the IODEVICE statement as described above to reduce the number of pseudo control units.

If a CNTLUNIT statement has no associated IODEVICE statement, only one pseudo control unit is created.

Defining CTC devices

When you define an IODEVICE statement to an unshared channel, each device number is associated with a CTC device. When you define an IODEVICE statement to a shared channel, unlike other types of devices where a device can be shared by multiple source partitions, a CTC device cannot be shared and each device number is internally replicated into multiple CTC devices; one for each pseudo control unit and each with the same device number.

The program in each sharing partition can use the same device number that is defined by the IODEVICE statement, but separate CTC devices are selected by the device number coupled with the source partition number.

The following IODEVICE statement example defines 6 CTC devices to control unit number 5150 defined above in System A:

```
  IODEVICE ADDRESS=(5150,6),CUNUMBR=5150,UNITADD=40,PART=(LP1A,LP2A),UNIT=SCTC
* 2 pseudo control units (LP1A to LP5B, LP2A to LP5B) are created
* Device numbers 5150-5155 are defined to pseudo control unit LP1A to LPB
* Device numbers 5150-5155 are defined to pseudo control unit LP2A to LPB
```

The following IODEVICE statement example defines 6 CTC devices to control unit number 6010 defined above in System B:

```
  IODEVICE ADDRESS=(6010,6),CUNUMBR=6010,UNITADD=40,PART=(LP5B,LP6B),UNIT=SCTC
* 2 pseudo control units (LP5B to LP1A, LP6B to LP1A) are created
* Device numbers 6010-6015 are defined to pseudo control unit LP5B to LPA
* Device numbers 6010-6015 are defined to pseudo control unit LP6B to LPA
```

The PART|PARTITION or NOTPART keyword in the IODEVICE statement can be coded to only configure CTC devices to certain source logical partitions. This is useful when defining CTC wraparound connections as in the CTC connection between *chpid* 50 and *chpid* 51 in System A. Six CTC devices are configured to control unit number 5110 representing LP1A, LP2A, LP3A, to *chpid* 51 in System A:

```
* PART keyword in IODEVICE excludes LP1A to have CTC access to itself.
  CNTLUNIT CUNUMBR=5110,PATH=51,LINK=C0,CUADD=1,UNITADD=((40,6)),UNIT=SCT
  IODEVICE ADDRESS=(5110,6),CUNUMBR=5110,UNITADD=40,PART=(LP2A,LP3A),UNITSCTC
```

or

```
* NOTPART keyword in IODEVICE excludes LP1A to have CTC access to itself.
  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
```

If the PART|PARTITION or NOTPART keyword is not coded, it implies that all partitions in the RESOURCE statement are configured to the CTC device. If the RESOURCE statement is not specified, it implies that all partitions defined by all the CHPID statements are configured to the CTC device.

The CTC devices that are defined to the corresponding pair of CTC pseudo control units form corresponding pairs of CTC devices. A corresponding pair of CTC devices make up a two-sided CTC device in the CTC channel to support a CTC communication. For instance, device number 5150 in LP1A corresponds to device number 6010 in LP5B. Note that corresponding device numbers between LP1A and

LP5B are inconsistent with corresponding device numbers between LP2A and LP5B. Device number 5150 in LP2A corresponds to device number 6020 in LP5B defined in the following:

```
IODEVICE ADDRESS=(6020,6),CUNUMBR=6020,UNITADD=40,PART=(LP5B,LP6B),UNIT=SCTC
```

A corresponding pair of CTC devices can have different device numbers, but they must use the same unit address. When defining a CNTLUNIT statement representing a destination partition sharing the channel at the other end of a CTC connection, the starting unit address in the UNITADD keyword applies to all pseudo control units that are created from this CNTLUNIT statement.

The following recommendations are useful when assigning unit addresses:

1. Assign the same starting unit address to all CTC CNTLUNIT statements defined to a channel with the same LINK address.
2. Assign the same starting unit address to all CNTLUNIT statements on both ends of a CTC connection. Note that the same CTC channel may have multiple CTC connections by means of an ESCON Director; each is connected to a different CNC or FCV channel.

Every pseudo control unit created from the same CNTLUNIT statement is allocated the same number of CTC devices as specified by the unit address range in the UNITADD keyword of the CNTLUNIT statement. However, depending on the device candidate list (PART|PARTITION or NOTPART keyword in the IODEVICE statement) for a CTC device, not every CTC device that is allocated to a pseudo control unit is defined to the pseudo control unit.

A device is defined to a pseudo control unit when the source partition is included in the device candidate list of the PART|PARTITION or NOTPART keyword in the associated IODEVICE statement. Otherwise, the device is allocated but not defined to that source partition or pseudo control unit, and it does not exist (condition code 3) when selected by a program.

The 512 CTC devices support limit by a CTC channel is calculated by adding up all allocated CTC devices for each pseudo control unit for each CNTLUNIT statement. It is therefore recommended to specify only the exact number required for the unit address range on the CNTLUNIT statement.

When source partitions do not have the same number of CTC devices defined to the same destination partition, the PART|PARTITION or NOTPART keyword can be used as described below to define various number of CTC devices to different partitions.

```
* If LP1A to LP5B has 1 CTC device, LP2A to LP5B has 4 CTC devices,
* LP3A to LP5B has 6 CTC devices, and LP4A to LP5B has no CTC device.
  IODEVICE ADDRESS=(5150,1),CUNUMBR=5150,UNITADD=40,PART=(LP1A,LP2A,LP3A),UNIT=SCTC
  IODEVICE ADDRESS=(5151,3),CUNUMBR=5150,UNITADD=41,PART=(LP2A,LP3A),UNIT=SCTC
  IODEVICE ADDRESS=(5154,2),CUNUMBR=5150,UNITADD=44,PART=(LP3A),UNIT=SCTC
* 3 pseudo control units are created and 18 devices are allocated.
* 1st IODEVICE statement defines 1 CTC device for LP1A,LP2A,and  LP3A.
* 2nd IODEVICE statement defines 3 additional devices for LP2A and LP3A
*  reflecting on the start unit address and range.
* 3rd IODEVICE statement defines 2 additional devices for LP3A only.
```

Redundant CTC configuration

Minimum Configuration

When using a single ESCON Director, the minimum number of shared CTC, CNC, and FCV channels required to allow any partition to communicate with any other partition is:

```
CTC channels = M            CNC or FCV channels = M
            where M = number of processor complexes

      One of each type of channel per processor complex
```

See Figure 34 on page 86.

Channel-redundant configuration

The minimum configuration provides alternative paths for CTC communications among processor complexes. However, it does not provide alternative paths between partitions in the same processor complex. An additional pair of shared CTC and CNC channels is required in this case. The number of CTC, CNC, and FCV channels required to allow any partition to communicate with any other partition is:

```
CTC channels = 2xM      CNC or FCV channels = 2xM
      where M = number of processor complexes

Two of each type of channel per processor complex
```

Fully redundant configuration

The above channel redundant configuration does not provide for ESCON Director failure. Full redundancy can be achieved with two ESCON Directors, each supporting minimum CTC configuration. The number of CTC, CNC, and FCV channels required to allow any partition to communicate with any other partition is:

```
CTC channels = 2xM            CNC or FCV channels = 2xM
      where M = number of processor complexes

Two of each type of channel per processor complex
```

See Figure 36 on page 94.

Non-MIF-to-MIF configurations

Non-MIF processors at certain SECs do not support connecting ESCON CTC channels to shared channels on MIF processors. On these processors, CTC channels can only connect to unshared channels.

Non-MIF processors at certain SECs and in some cases with Licensed Internal Code (LIC) patches installed do support connecting ESCON CTC channels to shared channels on MIF processors.

ESCON CNC channels on non-MIF processors at all SECs can connect to shared CTC channels on MIF processors.

When defining CTC control units, the following requirements apply:

- When defining CTC channel paths on a non-MIF processor, do not connect them to shared channels on a MIF processor if the non-MIF processor's SEC does not support the CUADD keyword on CTC channel paths. You can only connect the CTC channel paths to unshared channels. Do not code the CUADD keyword.
- When defining CTC channel paths on a non-MIF processor whose SEC supports the CUADD keyword on CTC channel paths, you can connect the CTC channel paths to unshared or shared channels.
- When defining CNC channel paths on a non-MIF processor, you can connect them to shared or unshared CTC channels.
- When connecting an unshared channel to a shared channel, the CTC control unit definition for the unshared channel must include the CUADD keyword with a non-zero value indicating the destination partition number at the other end of the CTC connection. Note that if a destination channel is shared by only one partition, it is still a shared channel.
- When connecting an unshared channel to a shared channel, the CTC control unit definition for the shared channel must not specify the CUADD keyword or specify it with a value of zero.

Check with your IBM representative to find out whether the CTC channel in your non-MIF processor supports connections to shared channels.

Chapter 3. ESCON CTC support for parallel CTC basic mode

CTC architectures

The parallel interface architecture described in *IBM Channel-to-Channel Adapter*, SA22-7091, defines both the basic and extended CTC operating modes. The ESCON interface described in *ESA/390: ESCON Channel-to-Channel Adapter*, SA22-7203, defines only one operating mode (extended mode). This operating mode is similar to the extended mode for the parallel interface described in *IBM Channel-to-Channel Adapter*, but with changes that support the ESA/390™ ESCON I/O interface architecture. See *IBM Channel-to-Channel Adapter* and *ESA/390: ESCON I/O Interface*, SA22-7202 for more information.

The architecture described in *ESA/390: ESCON Channel-to-Channel Adapter* does not support CTC basic mode.

Invoking basic mode

The CTC basic mode support is invoked, on a device basis, by coding BCTC instead of SCTC for the UNIT keyword on the IODEVICE statement assigned to the CTC channel path. It is recommended that the same device type be specified for devices assigned to CNC or FCV channel paths but this does not affect the mode of operation. The default device type for an SCTC control unit is SCTC, which specifies the device is to operate in the mode defined in the ESCON CTC architecture.

There is no change to the CNTLUNIT statement when invoking basic mode. Both SCTC and BCTC devices can be defined to the same CTC control unit with keyword UNIT=SCTC in the CNTLUNIT statement.

The following IODEVICE statements define one BCTC device (device number= 5150) and three SCTC devices (device numbers 5151–5153) to an unshared CTC channel.

```
CNTLUNIT CUNUMBR=5150,PATH=51,LINK=D0,CUADD=5,UNITADD=((40,4)),UNIT=SCTC
IODEVICE ADDRESS=(5150,1),CUNUMBR=5150,UNITADD=40,UNIT=BCTC
IODEVICE ADDRESS=(5151,3),CUNUMBR=5150,UNITADD=41,UNIT=SCTC
```

The following IODEVICE statements define, to a shared CTC channel:
- One BCTC device (device number=5150)
- Three SCTC devices (device numbers 5151–5153) for LP1A to LP5B
- Three SCTC devices (device numbers 5151–5153) for LP2A to LP5B
- Four SCTC devices (device numbers 5151–5154) for LP3A to LP5B

A total of 15 CTC devices (5 devices for each of the 3 pseudo control units) are allocated toward the 512 CTC devices support limit.

```
CNTLUNIT CUNUMBR=5150,PATH=51,LINK=D0,CUADD=5,UNITADD=((40,5)),UNIT=SCTC
IODEVICE ADDRESS=(5150,1),CUNUMBR=5150,UNITADD=40,PART=(LP1A),UNIT=BCTC
IODEVICE ADDRESS=(5151,3),CUNUMBR=5150,UNITADD=41,PART=(LP1A,LP2A,LP3A),UNIT=SCTC
IODEVICE ADDRESS=(5154,1),CUNUMBR=5150,UNITADD=44,PART=(LP3A),UNIT=SCTC
```

Unlike the IBM 3088 CTC devices, once an ESCON CTC device operating mode is specified by an IODEVICE statement, it cannot be switched to the other mode by the CTC command. The operating mode can only be changed by re-configuring the CTC device through dynamic I/O by means of HCD. To change a device's operating mode, HCD must delete the device first, then add the same device back in with a different mode.

Differences from parallel I/O CTC basic mode

The SCTC devices perform in compliance with the ESCON CTC architecture. The BCTC devices perform in accordance with the basic mode section of parallel I/O CTC Architecture with the following deviation:

1. If the CCW byte counts are equal for read/write matching pair commands pending on opposite sides of an ESCON CTC device (either SCTC or BCTC), neither channel detects an incorrect-length condition.
2. The ESCON BCTC devices cannot be switched to the extended mode by the Set Extended Mode CCW command. Set Extend Mode command is now interpreted as No-op. The following command codes, which are assigned by the parallel I/O basic mode CTC architecture, are now interpreted as No-op: 11001011, 1101x011, 11101011, and 1111x011.
3. The test I/O (TIO) command is not supported in the ESCON I/O interface architecture. Thus, it is not supported by the ESCON BCTC devices. If the TIO command is received by a BCTC device, it causes the CTC channel to detect an interface-control-check (IFCC) condition.
4. Data chaining in CTC channel programs is not supported. If the chain data CCW flag is set, the BCTC device detects an IFCC condition.

Sense ID command

The Sense ID (SID) command response is used by programs to verify the device operating mode. The SID response data for a BCTC device, as shown below, is the same for an SCTC device except that the device model number (byte 6) is :hex.01:ehex. for BCTC devices and X'00' for SCTC devices.

Byte 0: X'FF'	Byte 7: X'00'
Byte 1: X'30'	Byte 8: X'40'
Byte 2: X'88'	Byte 9: X'C4'
Byte 3: X'1F'	Byte 10: X'00'
Byte 4: X'00'	Byte 11: X'60'
Byte 5: X'00'	
Byte 6: X'01'	

Read configuration data command

A new Read Configuration Data (RCD) CCW command is added with command code X'11000100'.

The node element descriptor (NED) in the configuration record of the RCD command response can be used by programs to verify the device operating mode. Bytes 10–12 of the NED indicate the EBCDIC characters CTB (X'C3 E3 C2') for BCTC devices and the EBCDIC characters CTC (X'C3 E3 C3') for SCTC devices.

Deviations

The following deviations from the ESCON I/O interface architecture are necessary for software compatibility with existing CTC basic mode programs:

- The parallel I/O CTC basic mode architecture does not support unit-check status for reporting errors. Instead, it uses the 'disconnect-in' sequence to cause the attached parallel channel to detect an interface-control-check condition. Because there is no equivalent of the parallel I/O 'disconnect-in' sequence in the ESCON I/O architecture, a BCTC device can no longer report detected errors (link errors, hardware errors) by means of this mechanism. Instead, it uses the unconditional-disconnect (UD) /unconditional-disconnect-response (UDR) sequence of the ESCON I/O architecture to cause the attached ESCON channel to detect an interface-control-check (IFCC) condition. The BCTC device does not present unit check status following completion of the UD/UDR sequence as it is required by the ESCON I/O architecture. It depends on the channel to detect an IFCC error.
- Sense CCW command defined by the ESCON I/O architecture is not supported.

- The resetting-event condition defined by the ESCON I/O architecture is not supported.
- In basic mode X'04' command equals sense command byte (SCB).

Chapter 4. ESCON CTC device-specific functions

This chapter describes device-specific functions that the ESCON CTC implementation supports. ESCON CTC implements the ESA/390 ESCON channel-to-channel adapter architecture. See *ESA/390: ESCON Channel-to-Channel Adapter*, SA22-7203.

ESCON Extended Distance Feature (ESCON XDF)

The ESCON Extended Distance Feature (ESCON XDF) extends the ESCON link between the CTC channel and the ESCON Director from 3 kilometers (km) to 20 km. Both the ESCON Director port and its connected channel need the laser fiber-optic link (instead of the LED fiber-optic link) to enable this extension.

When two channels with XDF in a CTC connection are linked through two ESCON Directors (one of the directors must be a static connection), the maximum distance for the CTC connection is 60 km. Without XDF, the maximum distance is 9 km.

When a CTC and a CNC channel with XDF are connected directly without going through an ESCON Director, the maximum distance for the CTC connection is 20 km.

Support for parallel CTC basic mode

The ESCON channel-to-channel adapter architecture does not support parallel CTC basic mode. However, the ESCON CTC implementation provides support for parallel CTC basic to accommodate CTC channel programs running in parallel CTC basic mode.

Sense ID command

The Sense ID command response contains 12 bytes. The first 7 bytes are basic identification information and the next 5 bytes are extended identification information.

Control unit model number (byte 3) =X'1F' indicates that it is an integrated CTC control unit in the ESCON CTC channel. Device-model number (byte 6) indicates one of the two device models; :hex.00:ehex. for ESCON CTC devices that support ESCON CTC mode, and X'01' for ESCON CTC devices that support ESCON CTC basic mode.

Table 1. Sense ID data for an ESCON CTC device that supports ESCON CTC mode

Sense Byte	Hex Value	Field Description
Byte 0	FF	
Byte 1	30	Control unit type number
Byte 2	88	Control unit type number
Byte 3	1F	Control unit model number
Byte 4	00	Device type number
Byte 5	00	Device type number
Byte 6	00	Device model number
Byte 7	00	
Byte 8	40	
Byte 9	C4	
Byte 10	00	
Byte 11	60	

Table 2. Sense ID Data for an ESCON CTC Device that Supports ESCON CTC Basic Mode

Sense Byte	Hex Value	Field Description
Byte 0	FF	
Byte 1	30	Control unit type number
Byte 2	88	Control unit type number
Byte 3	1F	Control unit model number
Byte 4	00	Device type number
Byte 5	00	Device type number
Byte 6	01	Device model number
Byte 7	00	
Byte 8	40	
Byte 9	C4	
Byte 10	00	
Byte 11	60	

Beginning with byte 8, a 4-byte command information word is provided. It describes a command that can cause the device to perform a specific operation.
- Byte 8 is a flag indicating that the Read Configuration Data command is supported.
- Byte 9 contains the command code for the Read Configuration Data command.
- Bytes 10–11 contain the data transfer byte count for the read configuration data command.

Read configuration data command

The program sends a Read Configuration Data command, command code X'C4', to read a configuration record that contains information describing the internal configuration of the device.

The 96-byte configuration record consists of three 32-byte fields:
- Node element descriptor (NED)
- Token node element descriptor (token NED)
- General node element qualifier (general NEQ)

See *ESA/390: Common I/O Device Commands*, SA22-7204, for a description of NED and NEQ fields.

Node Element Descriptor (NED)

The sequence number indicator field (bits 3–4 of the flags byte) contains a code of X'01' to indicate that the sequence number in the NED may not be the sequence number of the processor complex. The first 4 bytes of the sequence number field are used for nonsequenced number purposes. See Table 3 on page 26.

All ESCON CTC devices for every ESCON CTC channel on a processor complex share the processor complex's sequence number; the last 8 bytes of which are stored in the last 8 bytes (bytes 22–29) of the sequence number field.

The information in bytes 18–21 and bytes 30–31 are needed to make ESCON CTC devices NED-unique to an operating system.

Programs sending Read Configuration Data commands to either side of an ESCON CTC device receive the same NED data.

The NED has the following format:

Table 3. Contents of Node Element Descriptor

Word	NED Format				
0	Flags	Type	Class	Resvd.	L
1	Type Number				
2	Type Number (c)		Model Number		
3	MN (c)	Manufacturer			
4	Plant of Mfg.		Sequence Number		
5	Sequence Number (c)				
6	Sequence Number (c)				
7	Sequence No. (c)		Tag		

Flags X'C8'

Type X'01'

Class X'09'

Reserved B'0000000'

Level B'0'

Type number

Characters in EBCDIC code that indicate the machine type for the processor complex to which the ESCON CTC channel is configured. For example, X'F0F0F9F0F0F0' is used to indicate an zSeries® 900 processor complex.

Model number

Three characters in EBCDIC code that indicate the ESCON CTC device model. For ESCON CTC devices supporting $ESCA. CTC mode, X'C3E3C3' (character CTC) is used. For ESCON CTC devices supporting ESCON CTC basic mode, X'C3E3C2' (character CTB) is used.

Manufacturer

Three characters in EBCDIC code that indicate the manufacturer of the processor complex to which the ESCON CTC channel is configured. X'C9C2D4' indicates IBM.

Plant of manufacture

Two characters in EBCDIC code that indicate the plant of manufacture of the processor complex to which the ESCON CTC channel is configured.

Bytes 0–3 of sequence number

These bytes are used for nonsequenced number purposes.

- Bytes 0–1 indicate the link address in EBCDIC of the CNC or FCV channel.
- Byte 2 contents depend on whether the ESCON CTC channel is shared:
  - If the ESCON CTC channel is shared, byte 2 indicates the logical partition number on the ESCON CTC channel side of the CTC communication associated with the device.
  - If the ESCON CTC channel is not shared, byte 2 indicates the partition number 0 in X'F0' EBCDIC code is indicated.
- Byte 3 contents depend on whether the ESCON (CNC or FCV) channel is shared:
  - If the ESCON (CNC or FCV) channel is shared, byte 3 indicates the logical partition number on the CNC or FCV channel side of the CTC communication associated with the device.
  - If the CNC or FCV channel is not shared, byte 3 indicates partition number 0 in X'F0' EBCDIC code.

Bytes 4–11 of the sequence number

Characters in EBCDIC code indicating the last 8 bytes of the sequence number for the processor complex to which the ESCON CTC channel is configured.

Tag

Two bytes, as follows:

- Byte 1 indicates the channel number on the processor complex to which the ESCON CTC is configured. For systems z900 and earlier, this is the physical channel number (CHID). For z990 systems and later, this is the logical channel number (CHPID) for the Channel Subsystem to which the ESCON CTC is configured with the processor complex.
- Byte 2 indicates the unit address used for this CTC access, which is the same for both sides of the CTC connection.

Token Node Element Descriptor (Token NED)

The serial number contained in the token NED is the 10-byte serial number of the processor complex to which the ESCON CTC channel is configured. The serial number indicator field of the flags byte has a value of X'10'.

The configuration data for each ESCON CTC device for an ESCON CTC channel has the same token NED.

The token NED has the following format:

Table 4. Contents of Node Element Descriptor

Word	Token NED Format				
0	Flags	Type	Class	Resvd.	L
1	Type Number				
2	Type Number (c)		Model Number		
3	MN (c)	Manufacturer			
4	Plant of Mfg.		Sequence Number		
5	Sequence Number (c)				
6	Sequence Number (c)				
7	Sequence No. (c)		Tag		

Flags X'F0'

Type X'01'

Class X'09'

Reserved B'0000000'

Level B'0'

Type number

Six characters in EBCDIC code that indicate machine type for the processor complex to which the ESCON CTC channel is configured. For example, X'F0F0F9F0F0F0' is used to indicate an zSeries 900 processor complex.

Model number

Three characters in EBCDIC code that indicate the processor complex model number for the processor complex to which the ESCON CTC channel is configured.

For ESCON CTC devices supporting $ESCA. CTC mode, X'C3E3C3' (character CTC) is used. For ESCON CTC devices supporting ESCON CTC basic mode, X'C3E3C2' (character CTB) is used.

Manufacturer

Three characters in EBCDIC code that indicate the manufacturer of the processor complex to which the ESCON CTC channel is configured. X'C9C2D4' indicates IBM.

Plant of manufacture

Two characters in EBCDIC code that indicate the plant of manufacture of the processor complex to which the ESCON CTC channel is configured.

Sequence number

Ten characters in EBCDIC code that indicate the sequence number for the processor complex to which the ESCON CTC channel is configured.

Tag

Two bytes, as follows:
- Byte 1 is X'00'.
- Byte 2 indicates the channel number on the processor complex to which the ESCON CTC channel is configured. For systems z900 and earlier, this is the physical channel number (CHID). For systems z990 and later, this is the logical channel number (CHPID) for the Channel Subsystem to which the ESCON CTC is configured within the processor complex.

General Node Element Qualifier (NEQ)

The general NEQ has the following format:

Table 5. Contents of General Node Element Qualifier

Word	NEQ Format		
0	Flags	RS	Interface ID
1	Reserved		
2	X'00000000'		
3	X'00000000'		
4	X'00000000'		
5	X'00000000'		
6	X'00000000'		
7	X'00000000'		

Flags X'80'

RS X'00'

Interface ID Byte 1 is X'00'

Byte 2 is:
- X'01' if the configuration record is requested by the system to which the ESCON CTC channel is configured
- X'02' if the record is requested by the system to which the ESCON CNC or FCV channel is configured

Reserved X'00000000'

Data chaining

The data chaining function is not supported by the ESCON CTC channel. If an ESCON CTC device receives a command frame with the chain data flag set, the command is rejected with unit check status. Bit 0 (command reject bit) of sense byte 0 is set to 1 to indicate this condition.

Auto disconnection

The ESCON CTC control unit uses the following mechanism to prevent a long CTC channel program from monopolizing the CTC channel resources for a prolonged period of time

When seven read, read backward, or write commands have been executed without channel disconnection and the eighth command is being received, the ESCON CTC device presents a deferred command retry status of 'channel end, status modifier, unit check' to both channels. The command retry status serves to free up the CTC channel resources and the ESCON link interface for other pending CTC communications.

If there is no other CTC operation pending, or after pending operations are processed, the CTC device requests reconnection and presents device-end status for the disconnected CTC operation to both channels to continue the CTC operation.

When 32 contiguous CTC independent commands have been executed without channel disconnection and the 33rd such command is being received, the ESCON CTC device presents unit check status to reject the command. The command reject bit is set in the side of the sense data in which the command was received.

Acquire link address

The link addresses assigned to the ESCON channels (including CTC channels) are not defined in the IOCP input. When the channels have dynamic connections through an ESCON Director, these link addresses are associated with the physical ports on the ESCON Director to which the channels attach.

The CTC channel behaves as an ESCON control unit on the ESCON link. The CTC channel issues the Acquire Link Address command during the link initialization procedure to acquire its link address either from the ESCON Director to which it attaches, or from the CNC channel at the other end of a connection via point-to-point or an ESCON Director static connection.

The subchannel associated with an ESCON CTC device at either end of a CTC communication has a link address of the channel at the other end of the CTC connection.

CTC channel reset

When a CTC channel is reset, the integrated CTC control units are reset. The CTC channel drops light on the ESCON link as part of the reset procedure. This action causes all CNC or FCV channels at the other end of CTC connections to report an interface-control-check error for all pending CTC operations (including channel disconnected CTC operations).

If the terminated CTC channel program is retried by the operating system hosting the CNC or FCV channels, and the CTC channel undergoing reset has not completed the reset procedure, the retried operation detects a nonoperational condition (condition code=3).

Not-operational condition is treated by the IBM CTC Error Recovery Program (ERP) as a permanent error, if the application requests posting on not-operational conditions and allows the IBM ERP to get control. If the application does not request posting on nonoperational conditions, the operating system queues the I/O operation until the CTC becomes operational.

Some of the conditions causing the CTC channel to be reset are as follows:

- Severe internal hardware errors
- For a non-MIF-capable processor:

  When a partition is either IPLed or System Reset, all ESCON channels (including CTC channels) configured to the partition are reset.

  When a processor is native-reset (POR), all channels (including CTC channels) are reset.
- For a MIF-capable processor:

  When a processor is operating in LPAR mode, and a partition sharing a CTC channel (shared channel) or owning the CTC channel (nonshared channel) is either IPLed or system reset, the CTC channel is not reset. Instead, the integrated CTC control units perform an ESCON device-level system reset function as if the signal was received from the host channel on behalf of that partition.

  When a processor is operating in LPAR mode, and it is native-reset (POR), all channels (including CTC channels) are reset.

  When a processor is operating in basic mode, and it is native-reset (POR) or system reset, all channels (including CTC channels) are reset.

Note: When the CTC channel reset is completed, the light on the ESCON link is re-transmitted. The systems hosting the CNC or FCV channels at the other end of CTC connections report a channel report word (CRW) after the logical path to the CTC control unit is reestablished.

Error reporting

The ESCON CTC channel reports errors and unusual conditions to the control program by presenting both 'unit check' status and the proper ending status. The causes of the errors are indicated in the sense bytes which can be retrieved by the Sense Adapter State command.

The ESCON CTC channel does not use the supplemental status frame which is defined in the ESCON I/O Interface architecture.

Error conditions such as receiving Transfer in Channel command, or detecting bad parity in data transfer are now reported by unit check status. These error conditions were previously reported by the I/O error alert facility in the parallel I/O architecture, which resulted in an interface control check condition being presented to the control program.

Chapter 5. Recommendations for numbering CTC control units and devices

This chapter describes a methodology for choosing control unit numbers and device numbers for ESCON CTC and FICON CTC configurations.

Numbering CTC control units and devices

It is recommended to use a Send and Receive pair of CTC devices for communicating. The send devices will be on one control unit while the receive devices will be on another control unit. Some applications require the use of Send and Receive pairs of devices and cannot use a single device for both sending and receiving data.

Assign a CTC image ID to every logical partition or basic mode CPC to which you want to establish CTC communication. This CTC image ID is only for managing your CTC definition and is not used by CTC communication. The CTC image ID is a two-digit hexadecimal number in the range X'00' to X'FF' and must be a unique value within your complex. The ID therefore will identify a specific image in your complex and is used by every other image to address that specific image.

The control unit and device numbers will consist of 4 digits. The first digit identifies the control unit or device as being used to Send or Receive. Use an even hexadecimal number when defining Send control units and devices and use an odd hexadecimal number when defining Receive control units and devices. The second and third digits are the CTC image ID. The fourth hexadecimal digit identifies primary and secondary connections. A value of 0 to 7 is used for the primary connection. A value of 8 to F is used for secondary connections which are used to increase availability of the CTC connections.

This methodology allows each system control program (SCP) to use the same subsystem definition. The subsystem definitions for each SCP are independent of the CPC image in which the SCP is operating.

The following figure illustrates an ESCON CTC configuration using this methodology. A similar configuration can exist for FICON CTC but is not shown. See Appendix C, “Notices” for FICON CTC configuration examples using this methodology.

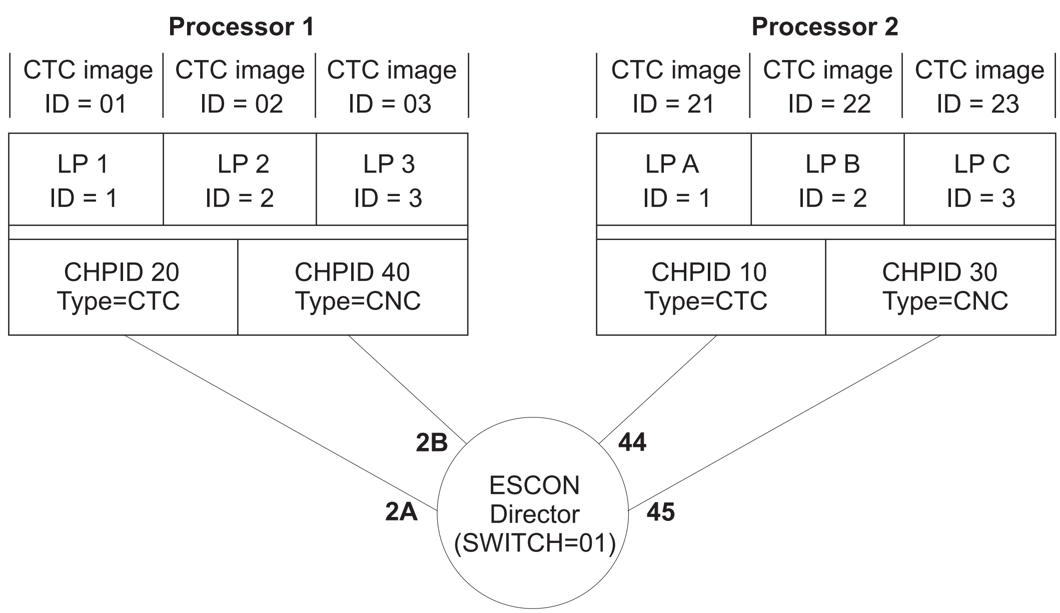

Figure 12. Shared ESCON CTC configuration

The following shows the IOCP statements for the primary connections that correspond to this configuration.

```
* Processor 1
*
 RESOURCE PART=((LP1,1),(LP2,2),(LP3,3))
*
 CHPID PATH=20,TYPE=CTC,SWITCH=01,PART=((LP1,LP2,LP3),(=)),SHARED
 CHPID PATH=40,TYPE=CNC,SWITCH=01,PART=((LP1,LP2,LP3),(=)),SHARED
```

```
*
* Send SCTC Control Unit and Device Definitions to CTC image ID 01
*
 CNTLUNIT CUNUMBR=4010,PATH=20,LINK=2B,CUADD=1,UNITADD=((00,8)),UNIT=SCTC
 IODEVICE ADDRESS=(4010,8),CUNUMBR=4010,UNITADD=00,UNIT=SCTC,NOTPART=LP1
*
* Send SCTC Control Unit and Device Definitions to CTC image ID 02
*
 CNTLUNIT CUNUMBR=4020,PATH=20,LINK=2B,CUADD=2,UNITADD=((00,8)),UNIT=SCTC
 IODEVICE ADDRESS=(4020,8),CUNUMBR=4020,UNITADD=00,UNIT=SCTC,NOTPART=LP2
*
* Send SCTC Control Unit and Device Definitions to CTC image ID 03
*
 CNTLUNIT CUNUMBR=4030,PATH=20,LINK=2B,CUADD=3,UNITADD=((00,8)),UNIT=SCTC
 IODEVICE ADDRESS=(4030,8),CUNUMBR=4030,UNITADD=00,UNIT=SCTC,NOTPART=LP3
*
* Send SCTC Control Unit and Device Definitions to CTC image ID 21
*
 CNTLUNIT CUNUMBR=4210,PATH=20,LINK=45,CUADD=1,UNITADD=((00,8)),UNIT=SCTC
 IODEVICE ADDRESS=(4210,8),CUNUMBR=4210,UNITADD=00,UNIT=SCTC
*
* Send SCTC Control Unit and Device Definitions to CTC image ID 22
*
 CNTLUNIT CUNUMBR=4220,PATH=20,LINK=45,CUADD=2,UNITADD=((00,8)),UNIT=SCTC
 IODEVICE ADDRESS=(4220,8),CUNUMBR=4220,UNITADD=00,UNIT=SCTC
*
* Send SCTC Control Unit and Device Definitions to CTC image ID 23
*
 CNTLUNIT CUNUMBR=4230,PATH=20,LINK=45,CUADD=3,UNITADD=((00,8)),UNIT=SCTC
 IODEVICE ADDRESS=(4230,8),CUNUMBR=4230,UNITADD=00,UNIT=SCTC
*
* Receive SCTC Control Unit and Device Definitions from CTC image ID 01
*
 CNTLUNIT CUNUMBR=5010,PATH=40,LINK=2A,CUADD=1,UNITADD=((00,8)),UNIT=SCTC
 IODEVICE ADDRESS=(5010,8),CUNUMBR=5010,UNITADD=00,UNIT=SCTC,NOTPART=LP1
*
* Receive SCTC Control Unit and Device Definitions from CTC image ID 02
*
 CNTLUNIT CUNUMBR=5020,PATH=40,LINK=2A,CUADD=2,UNITADD=((00,8)),UNIT=SCTC
 IODEVICE ADDRESS=(5020,8),CUNUMBR=5020,UNITADD=00,UNIT=SCTC,NOTPART=LP2
*
* Receive SCTC Control Unit and Device Definitions from CTC image ID 03
*
 CNTLUNIT CUNUMBR=5030,PATH=40,LINK=2A,CUADD=3,UNITADD=((00,8)),UNIT=SCTC
 IODEVICE ADDRESS=(5030,8),CUNUMBR=5030,UNITADD=00,UNIT=SCTC,NOTPART=LP3
*
* Receive SCTC Control Unit and Device Definitions from CTC image ID 21
*
 CNTLUNIT CUNUMBR=5210,PATH=40,LINK=44,CUADD=1,UNITADD=((00,8)),UNIT=SCTC
 IODEVICE ADDRESS=(5210,8),CUNUMBR=5210,UNITADD=00,UNIT=SCTC
*
* Receive SCTC Control Unit and Device Definitions from CTC image ID 22
*
 CNTLUNIT CUNUMBR=5220,PATH=40,LINK=44,CUADD=2,UNITADD=((00,8)),UNIT=SCTC
 IODEVICE ADDRESS=(5220,8),CUNUMBR=5220,UNITADD=00,UNIT=SCTC
*
* Receive SCTC Control Unit and Device Definitions from CTC image ID 23
*
 CNTLUNIT CUNUMBR=5230,PATH=40,LINK=44,CUADD=3,UNITADD=((00,8)),UNIT=SCTC
 IODEVICE ADDRESS=(5230,8),CUNUMBR=5230,UNITADD=00,UNIT=SCTC

* Processor 2
*
 RESOURCE PART=((LPA,1),(LPB,2),(LPC,3))
*
 CHPID PATH=10,TYPE=CTC,SWITCH=01,PART=((LPA,LPB,LPC),(=)),SHARED
 CHPID PATH=30,TYPE=CNC,SWITCH=01,PART=((LPA,LPB,LPC),(=)),SHARED
```

```
*
* Send SCTC Control Unit and Device Definitions to CTC image ID 01
*
 CNTLUNIT CUNUMBR=4010,PATH=10,LINK=2B,CUADD=1,UNITADD=((00,8)),UNIT=SCTC
 IODEVICE ADDRESS=(4010,8),CUNUMBR=4010,UNITADD=00,UNIT=SCTC
*
* Send SCTC Control Unit and Device Definitions to CTC image ID 02
*
 CNTLUNIT CUNUMBR=4020,PATH=10,LINK=2B,CUADD=2,UNITADD=((00,8)),UNIT=SCTC
 IODEVICE ADDRESS=(4020,8),CUNUMBR=4020,UNITADD=00,UNIT=SCTC
*
* Send SCTC Control Unit and Device Definitions to CTC image ID 03
*
 CNTLUNIT CUNUMBR=4030,PATH=10,LINK=2B,CUADD=3,UNITADD=((00,8)),UNIT=SCTC
 IODEVICE ADDRESS=(4030,8),CUNUMBR=4030,UNITADD=00,UNIT=SCTC
*
* Send SCTC Control Unit and Device Definitions to CTC image ID 21
*
 CNTLUNIT CUNUMBR=4210,PATH=10,LINK=45,CUADD=1,UNITADD=((00,8)),UNIT=SCTC
 IODEVICE ADDRESS=(4210,8),CUNUMBR=4210,UNITADD=00,UNIT=SCTC,NOTPART=LPA
*
* Send SCTC Control Unit and Device Definitions to CTC image ID 22
*
 CNTLUNIT CUNUMBR=4220,PATH=10,LINK=45,CUADD=2,UNITADD=((00,8)),UNIT=SCTC
 IODEVICE ADDRESS=(4220,8),CUNUMBR=4220,UNITADD=00,UNIT=SCTC,NOTPART=LPB
*
* Send SCTC Control Unit and Device Definitions to CTC image ID 23
*
 CNTLUNIT CUNUMBR=4230,PATH=10,LINK=45,CUADD=3,UNITADD=((00,8)),UNIT=SCTC
 IODEVICE ADDRESS=(4230,8),CUNUMBR=4230,UNITADD=00,UNIT=SCTC,NOTPART=LPC
*
* Receive SCTC Control Unit and Device Definitions from CTC image ID 01
*
 CNTLUNIT CUNUMBR=5010,PATH=30,LINK=2A,CUADD=1,UNITADD=((00,8)),UNIT=SCTC
 IODEVICE ADDRESS=(5010,8),CUNUMBR=5010,UNITADD=00,UNIT=SCTC
*
* Receive SCTC Control Unit and Device Definitions from CTC image ID 02
*
 CNTLUNIT CUNUMBR=5020,PATH=30,LINK=2A,CUADD=2,UNITADD=((00,8)),UNIT=SCTC
 IODEVICE ADDRESS=(5020,8),CUNUMBR=5020,UNITADD=00,UNIT=SCTC
*
* Receive SCTC Control Unit and Device Definitions from CTC image ID 03
*
 CNTLUNIT CUNUMBR=5030,PATH=30,LINK=2A,CUADD=3,UNITADD=((00,8)),UNIT=SCTC
 IODEVICE ADDRESS=(5030,8),CUNUMBR=5030,UNITADD=00,UNIT=SCTC
*
* Receive SCTC Control Unit and Device Definitions from CTC image ID 21
*
 CNTLUNIT CUNUMBR=5210,PATH=30,LINK=44,CUADD=1,UNITADD=((00,8)),UNIT=SCTC
 IODEVICE ADDRESS=(5210,8),CUNUMBR=5210,UNITADD=00,UNIT=SCTC,NOTPART=LPA
*
* Receive SCTC Control Unit and Device Definitions from CTC image ID 22
*
 CNTLUNIT CUNUMBR=5220,PATH=30,LINK=44,CUADD=2,UNITADD=((00,8)),UNIT=SCTC
 IODEVICE ADDRESS=(5220,8),CUNUMBR=5220,UNITADD=00,UNIT=SCTC,NOTPART=LPB
*
* Receive SCTC Control Unit and Device Definitions from CTC image ID 23
*
 CNTLUNIT CUNUMBR=5230,PATH=30,LINK=44,CUADD=3,UNITADD=((00,8)),UNIT=SCTC
 IODEVICE ADDRESS=(5230,8),CUNUMBR=5230,UNITADD=00,UNIT=SCTC,NOTPART=LPC
```

Each definition prevents communication from an image to itself. This is accomplished with the NOTPART keyword (or PART keyword) on the IODEVICE statement. For example, images LP2 and LP3 on Processor 1 can use devices 4010-4017 to send data to image LP1 but image LP1 cannot send data to itself using those devices.

For ESCON CTC connections, define all Send CTC control units and devices on a CTC or CNC channel and all the Receive CTC control units and devices on the other CTC or CNC channel to which it is connected. It does not matter which channel type (CTC or CNC) has the Send CTC definitions and which has the Receive CTC definitions.

The above configuration and IOCP example works equally well for FICON CTC. Simply substitute channel path type FC for CNC and CTC and control unit and device type FCTC for SCTC. However, FICON CTC configurations using a single FICON channel cannot use the complete methodology described here. A CTC image ID can be used for the second and third digits of the control unit and device numbers. But the first digit cannot use even numbers for just send devices and odd numbers for just receiving devices. Also, each system control program (SCP) must have a customized device definition. See "FICON CTC and Director with Single Path" on page B-2 for an example.

Note: When communicating to a shared FC channel path on an IBM System z9®® or zSeries processor other than a z/800 or z/900, the logical address (CUADD keyword on CNTLUNIT statement) specified must be two digits if the destination logical partition has a non-zero CSS ID. For example, if the destination logical partition is in CSS 1 and has MIF image ID 5, specify CUADD=15.

Chapter 6. FICON channel-to-channel introduction

CTC communication and connection

A FICON channel-to-channel (CTC) connection consists of an input/output (I/O) device that is used by a program in one system to communicate with a program in another system. A CTC communication is established between two programs when he adapter is selected to respond to channel-command words (CCWs) that are issued by the channels in the CTC connection.

FICON CTC increases the connectivity options for customers. Now, each of any two systems that have at least one FICON channel connected to the network can have CTC connections set up between them with no additional cost. Customers no longer have to dedicate channel path (CHPID) resources to the CTC function. In the Fibre Connection (FICON) channel I/O interface environment, a stand-alone CTC adapter unit is not used to provide the switching function. Similar to ESCON CTC, the switching function is provided by the FICON Director. CTC connections between channels can be made by going through a FICON Director. The CTC adapter function is implemented logically between connecting channels and resides in the FICON channel.

The fibre channel path functions as both a channel and a channel-to-channel at the same time. It provides self configuration and load balancing of the CTC function among FICON channel paths, including proper configuration when the target channel does not have an integrated CTC.

FICON CTC connections require that at least one end of the connection be on the following CPC which supports the FICON CTC control unit function:
- System z general purpose models at EC J10638 or later.

The other end of the FICON CTC connection can be on any CPC that supports FC channel paths. If neither FC channel path is on a CPC listed above, no FICON CTC connection will be established and the CTC devices will be unusable.

FICON CTC acts as a dual-sided control unit, providing control unit function for both the local inboard channel and an outboard channel on the other side of the fibre channel network. CTC function does not access storage or any system facilities.

Auto-configuration

In the FICON architecture, device level communication between a channel and control unit requires that a Logical Path is established between them. In the case of FICON CTC, one or two channels each talk to a two-sided control unit which is internal to the FICON channel. Therefore, two logical paths are required for a complete CTC connection.

The Local logical path is established across the internal link between the channel function and the CTC function on the same CHPID. The Remote logical path is established across the Fibre Channel link. This path connects the two CHPIDs through the switch in Figure 13 on page 39 or can also be point-to-point. In the case of a single FICON channel used to configure LPAR to LPAR communication within a CPC, the channel establishes both the local and remote logical paths.

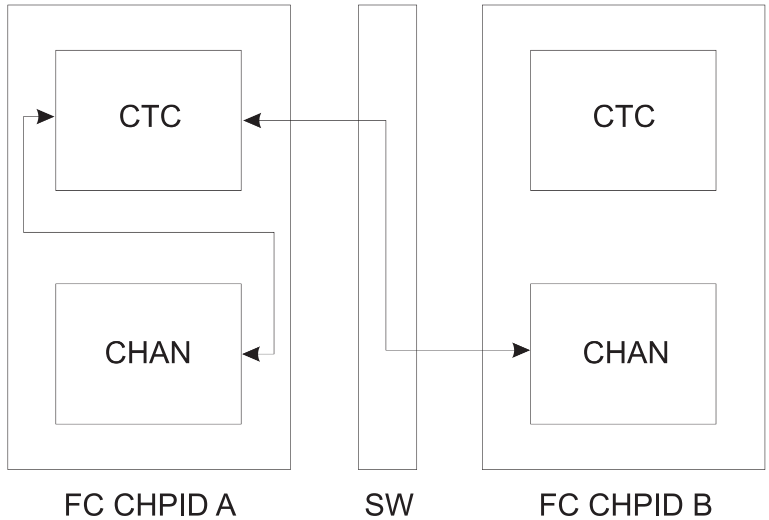

Figure 13. Typical Logical Path pair between two FC CHPIDs

To define a FICON CTC connection, you must define two FICON CTC control units with control unit types of FCTC. The FICON channels negotiate with each other and only one of the channels will contain a single CTC control unit internal to the channel for the CTC connection. This negotiation is described as auto-configuration. Auto-configuration determines which FICON channel contains the CTC control unit for each connection and pair of logical paths. If only one of the channels is on a CPC that supports the FICON CTC control unit function, the FICON CTC control unit is always on that channel. If both channels are on a CPC that supports the FICON CTC control unit function, the channels perform load balancing to determine which channel will have the FICON CTC control unit. The channel with the fewest CTC logical paths will have the FICON CTC control unit for the connection. This balances the load that FICON CTC connections will place on each channel.

Summary of differences between ESCON and FICON CTC

There are several differences between ESCON CTC communication and FICON CTC communication:

- ESCON CTC communication requires a pair of ESCON channels where one channel is defined as an ESCON CTC channel and the other channel is defined as an ESCON CNC channel. FICON CTC communication can be established using one or two FICON FC channels. FICON CTC connections require control unit types of FCTC.
- The ESCON CTC channel is dedicated to supporting the CTC function and cannot be used to communicate with I/O devices (e.g. tape, disk, etc.). FICON FC channels involved with FICON CTC communication can also communicate with I/O devices.
- The ESCON CTC channel only supports 512 device unit addresses. FICON FC channels support 16384 device unit addresses.
- FICON has a greater data transfer bandwidth and higher I/O rate than ESCON.
- FICON supports multiple concurrent I/O operations. ESCON supports only one actively communicating I/O operation.
- FICON channels are full duplex because they can send and receive data at the same time. ESCON channels are half duplex because they can send or receive data at any given time but not both.
- When communicating to a shared FC channel path on a System z9 or zSeries processor other than a z/800 or z/900, the logical address (CUADD keyword on CNTLUNIT statement) specified must be two digits if the destination logical partition has a non-zero CSS ID. For example, if the destination logical partition is in CSS 1 and has MIF image ID 5, specify CUADD=15.

Partition-to-partition communication

The local CTC function is always used by definition for partition-to-partition communication so load balancing is not an issue. With FICON partition-to-partition communication technology, communication between logical partitions of a single physical system can be achieved utilizing only a single physical FICON channel attached to a FICON Director switch.

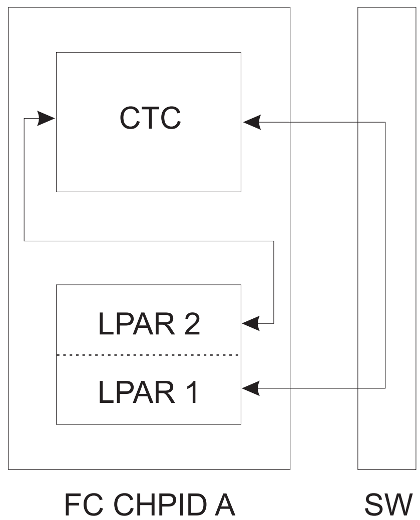

Figure 14. FICON partition-to-partition

FICON CTC channel

A FICON channel with CTC capability may behave as both a standard FICON channel connecting to standard FICON I/O control units, as well as having an internal CTC control unit function in support of CTC connections. Unlike ESCON, there is no special channel type. There is only a new control unit type (FCTC) that must be specified to IOCP or HCD in the control unit definition.

A CTC connection requires one or two FICON channels, at least one of which is capable of providing CTC control unit functionality (i.e. the CPC is at EC J10638 or later). A CTC connection supports bidirectional CTC communications. The FICON channels involved in a CTC connection can send and receive information to each other.

Two FICON channels can be connected to each other point-to-point or using dynamic communication within a FICON Director. One FICON channel can connect to itself using a FICON Director.

Neither FICON channel must be dedicated exclusively to CTC operations. They can be configured to dynamically access any other FICON I/O control units attached to the same FICON Director.

The FICON CTC control unit function is integrated into the FICON channel on the CPCs listed in "CTC Communication and Connection" on page 6-2. A virtual link exists between the channel section and the CTC control unit section of the FICON channel. Logically, a CTC control unit exists between its own channel section and the FICON channel to which it is connected. When connecting two FICON channels, auto-configuration determines which FICON channel contains the CTC control unit for that connection. See Figure 15 on page 41. In Figure 6-5, the FICON FC channels attached to the FICON Director can also attach to other I/O devices (e.g. disk, tape, etc.).

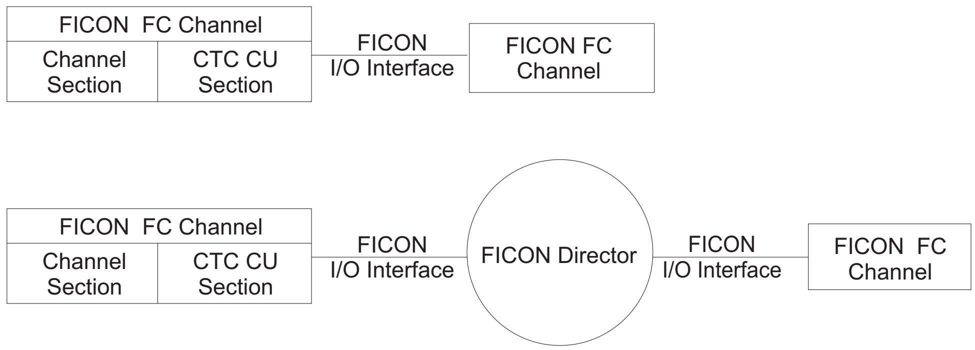

Figure 15. FICON CTC channel structure

You can also establish a FICON CTC connection between LPARs on the same CPC using a single FICON FC channel. See Figure 16. The FICON channel must attach to a FICON Director for this type of CTC connection. In addition, the FICON channel can attach to other I/O devices (e.g. disk, tape, etc.).

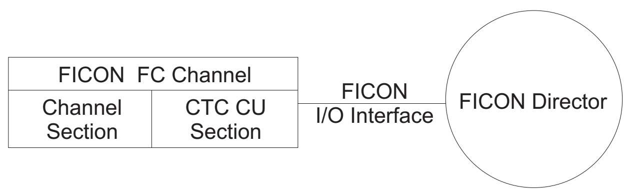

Figure 16. FICON CTC connection using a single FICON FC channel

In Figure 17, assuming that each FICON channel is on a CPC that supports the FICON CTC control unit function:

- Each FICON channel can form a CTC connection with every other FICON channel.
- Each FICON channel can form a CTC connection with itself.
- Each FICON channel can access other FICON I/O control units (e.g. FICON DASD and FICON Tape).

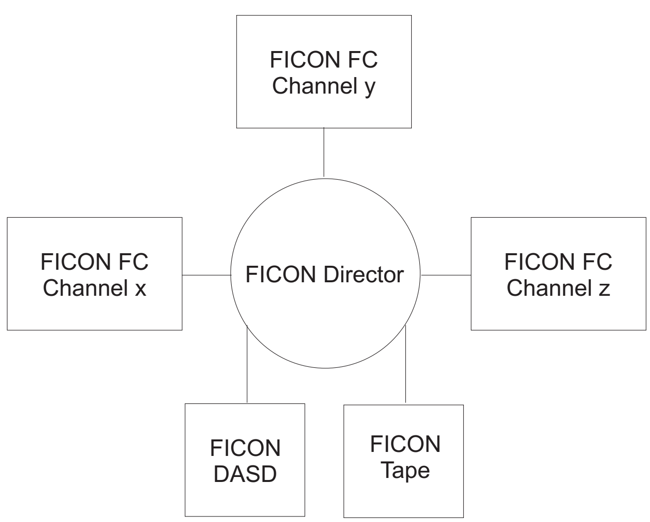

Figure 17. FICON FC channel configuration with a FICON director

Unshared channel

Unshared channels are dedicated to a single partition in LPAR mode or are on a processor running in basic mode. If an unshared channel is reconfigurable, it can be deconfigured from one partition and reconfigured to another partition.

Channels at either or both ends of a CTC connection can be shared or unshared.

Shared channel

If a processor complex is running in LPAR mode, its logical partitions can share channel paths to reduce the number of physical connections between processor complexes. FC channels can be defined as shared channels.

FICON CTC control unit

The CTC control unit section in a FICON channel can consist of multiple CTC control units. A CTC control unit is a two-sided control unit. One side is internal to the FICON channel that is providing the CTC control unit functions. The other side is connected to another FICON channel on a FICON interface. Each side is configured individually to its corresponding channel as a CTC control unit and is accessed independently by its corresponding channel. Each separately configured control unit represents one side of a two-sided CTC control unit in the FICON channel. See Figure 18 on page 42.

1. When an unshared FICON channel (FC) with integrated CTC function is connected to another unshared FC channel, only one CTC control unit can be configured for the CTC connection. The two-sided control unit is used between the partitions owning the FC channel with integrated CTC function and the other FC channel.

   In Figure 18, the CTC control unit 1 is configured for the CTC connection between FC channel x (with integrated CTC function) on System A and FC channel x on System B. CTC control unit 2 is configured for the CTC connection between FC channel x on System A and FC channel y on System B. CTC control unit 3 is configured for the CTC connection between FC channel x on System A and FC channel z on System B.

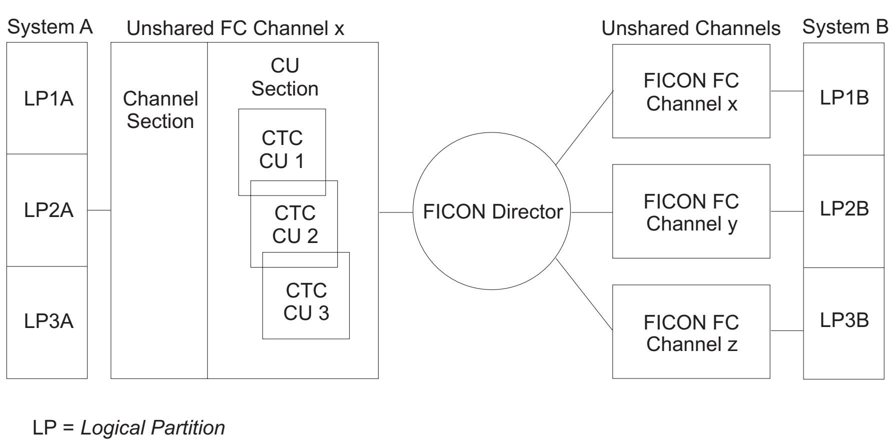

Figure 18. Unshared FC channel to unshared FC channel

2. When an unshared FC channel with integrated CTC function is connected to a shared FC channel, a two-sided control unit can be configured between the partition owning the FC channel with integrated CTC function and each partition sharing the other FC channel.

   In Figure 19 on page 43, three CTC control units can be configured between LP2A in System A and each partition in System B.

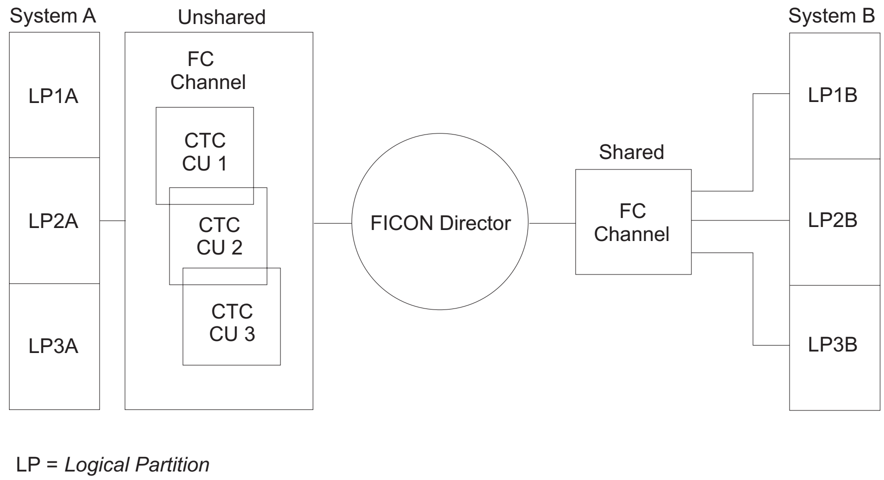

Figure 19. Unshared FC channel to shared FC channel

3. When a shared FC channel with integrated CTC function is connected to an unshared FC channel, a two-sided control unit can be configured between each partition sharing the FC channel with integrated CTC function and the partition owning the unshared FC channel.

   In Figure 20, three CTC control units can be configured between each partition in System A and LP2B in System B.

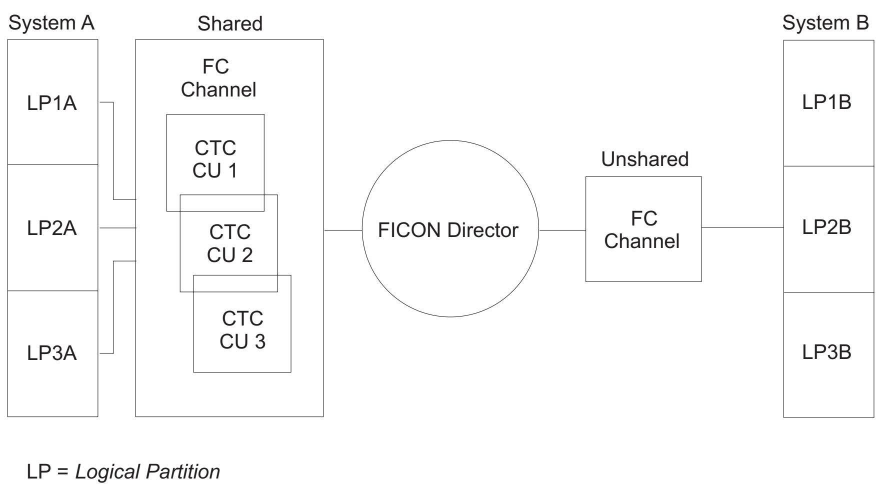

Figure 20. Shared FC channel to unshared FC channel

4. When a shared FC channel with integrated CTC function is connected to another shared FC channel, a two-sided CTC control unit can be configured between each partition sharing the FC channel with integrated CTC function and each partition sharing the other FC channel.

   In Figure 21 on page 44, only three CTC control units need to be configured for the CTC connection between System A and System B. CTC control unit (CU) 1 is configured for the CTC connections between all logical partitions accessing FC channel x with integrated CTC function on System A and LP1B on System B. CTC CU 2 is configured for the CTC connections between all logical partitions accessing FC channel x with integrated CTC function on System A and LP2B on System B. CTC CU 3 is configured for the CTC connections between all logical partitions accessing FC channel x with integrated CTC function on System A and LP3B on System B.

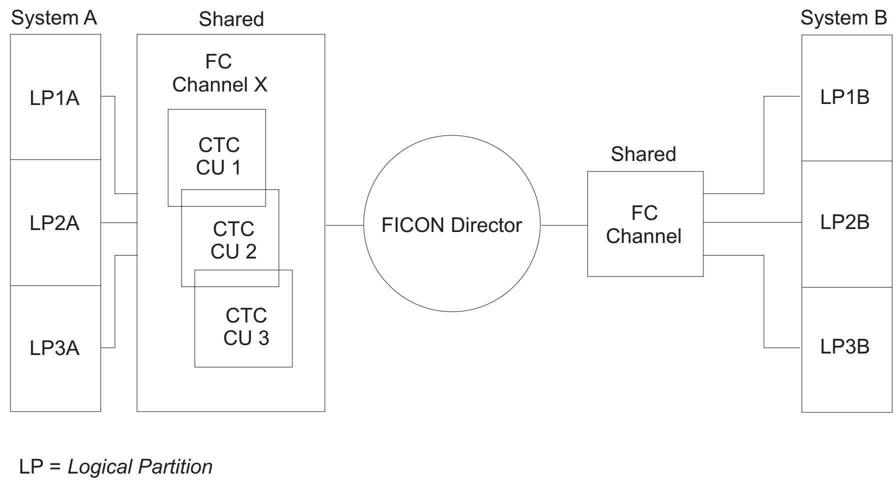

Figure 21. Shared FC channel to shared FC channel

FICON CTC device

Multiple CTC devices can be configured to a CTC control unit after the CTC control unit is defined.

A FICON CTC device is a two-sided device. It provides the data path and synchronization for data transfer between the two channels it connects. Each side is configured individually to its corresponding channel as a CTC device and is accessed independently by its corresponding channel. Each separately configured CTC device represents one side of a two-sided CTC device.

Both sides of the CTC device must have the same unit address defined in IOCP.

Each two-sided CTC device is capable of supporting a CTC communication between two programs. There can be multiple CTC communications in progress between an FC channel with integrated CTC function and the FC channel to which it connects at any given time.

Chapter 7. Using IOCP to define a FICON CTC configuration

FICON CTC configurations

This chapter describes the methods of defining FICON CTC configurations to the Input/Output Configuration Program (IOCP). See Appendix B, "FICON configuration examples" for IOCP source input examples.

Hardware configuration definition (HCD) can also be used for defining FICON CTC configurations. Rules and recommendations described in this document are applicable. For more information on IOCP, see the *IOCP User's Guide for IYP IOCP*

Peer-to-peer

When defining FICON CTC control units and devices, the integrated CTC control units, as described in "FICON CTC channel" on page 40, are not considered by IOCP to be within the channel. Instead, IOCP views the CTC control units and devices to be within the FC channel at the other end of a CTC connection. From the viewpoint of IOCP, the two channels in a FICON CTC connection can be considered as communicating directly with each other in a peer-to-peer fashion, without the integrated CTC control units in between. With unshared channels, each channel defines a CTC control unit for the channel at the other end of a CTC connection. With shared channels, each channel defines a CTC control unit for each partition which shares the channel at the other end of a CTC connection.

Configuration limits

A FICON channel supports up to 256 two-sided CTC control units and 16384 two-sided CTC devices. A maximum of 256 FICON CTC devices can be configured to a CTC control unit.

It is recommended that you use your FC channels for non-CTC devices in addition to CTC devices to take advantage of the throughput capacity of the channels as well as their full-duplex capability.

Shared and unshared configurations

Channels that are unshared are configured to a single logical partition in LPAR mode (or to the entire processor in basic mode). Channels that are shared can be simultaneously configured to multiple logical partitions in LPAR mode.

This section describes how to define FICON CTC configurations to IOCP for both shared and unshared channel paths. Figure 7-1 is referenced throughout the following IOCP statement examples. FC CHPID 50 is shared and configured to logical partitions LP1A, LP2A and LP3A in System A. FC CHPID 60 is unshared and configured to logical partition LP1B in System B.

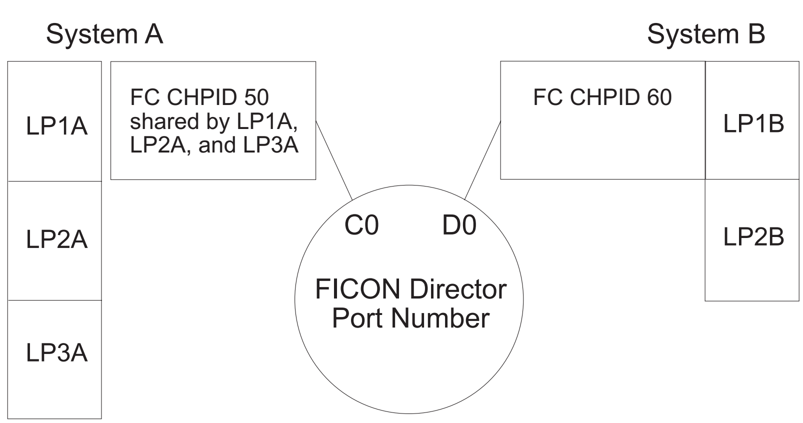

Figure 22. Shared and unshared configuration

Note: The terms source and destination are used in this document to indicate two ends of a CTC connection. When you define CTC control units and devices to the system at one end (source) of a CTC connection, the other end of the CTC connection is referred as the destination. A CTC connection supports bidirectional CTC communications. The FC channels of a FICON CTC connection can be viewed as both source and destination depending on which end is the connection being defined.

Defining CHPIDs

Code the *chpid* number with the PATH keyword. Code the TYPE keyword as FC. If the connection is by means of a FICON Director, specify a number on the SWITCH keyword.

The following RESOURCE and CHPID statement example defines shared FC channel *chpid* 50 in System A:

```
RESOURCE PARTION=((LP1A,1),(LP2A,2),(LP3A,3))
CHPID PATH=50,TYPE=FC,SHARED,PART=((LP1A,LP2A,LP3A),(=)),SWITCH=01
```

The following CHPID statement example defines unshared FC channel chpid 60 in System B:

```
CHPID PATH=60,TYPE=FC,PART=LP1B,SWITCH=01
```

Defining CTC control units

When you define FICON CTC control units, an unshared channel at the other end of a CTC connection is associated with a single CTC control unit. When you have a shared channel at the other end of a CTC connection, each partition sharing the channel path is associated with a separate control unit. It does not matter which channel actually has the FICON CTC control unit function.

- If the CTC connection is through a FICON Director, specify the port address of the channel at the other end of the CTC connection with the LINK keyword in the CNTLUNIT statement for that channel.
- If the CTC connection is point-to-point, do not specify the LINK keyword in the CNTLUNIT statement.

Control unit type keyword UNIT must be coded as FCTC to enable the CTC control unit in the FICON channel. Also, the unit addresses specified for each CTC connection must be identical. For the FICON CTC connection to be successful, at least one end of the connection must be on the following CPC:

- System z general purpose models at EC J10638 or later.

The other end of the FICON CTC connection can be on any CPC that supports FC channel paths. If neither FC channel path is on a CPC listed above, no FICON CTC connection will be established and the CTC devices will be unusable.

When connecting to a shared channel path (as System B is doing with CHPID 50 in System A), it is necessary to specify a control unit for each logical partition that the shared CHPID has access to and with which you want to communicate. Also, it is necessary to identify to which logical partition each control unit is associated. This is accomplished by specifying the partition number or CSS ID and MIF image ID of the destination partition in the CUADD keyword. When communicating to a shared FC channel path on a System z9 or zSeries processor other than a z/800 or z/900, the CUADD keyword value must be two digits if the destination logical partition has a non-zero CSS ID. For example, if the destination logical partition is in CSS 1 and has MIF image ID 5, specify CUADD=15.

Do not code the CUADD keyword if the destination CHPID is not shared.

Define a CTC control unit for each destination partition to which you want to connect. For System A, specify the following:

```
CNTLUNIT CUNUMBR=4B10,PATH=50,LINK=D0,UNITADD=((40,8)),UNIT=FCTC
```

For System B, specify the following:

```
CNTLUNIT CUNUMBR=5A10,PATH=60,LINK=C0,UNITADD=((40,8)),UNIT=FCTC,CUADD=1
CNTLUNIT CUNUMBR=5A20,PATH=60,LINK=C0,UNITADD=((40,8)),UNIT=FCTC,CUADD=2
CNTLUNIT CUNUMBR=5A30,PATH=60,LINK=C0,UNITADD=((40,8)),UNIT=FCTC,CUADD=3
```

All three partitions in System A will use control unit 4B10 to communicate with partition LP1B in System B. System B will use control unit 5A10 to communicate with partition LP1A in System A, control unit 5A20 to communicate with partition LP2A and control unit 5A30 to communicate with partition LP3A.

Using the recommended control unit numbering method described in Chapter 5, we could assign CTC image IDs of A1 to LP1A, A2 to LP2A, A3 to LP3A and B1 to LP1B. We would also define separate Send and Receive control units. But to do so requires a second pair of FC channels. Assume CHPID 51 is on System A, connects to port C1 on the FICON Director, and is shared by the same partitions as CHPID 50. Assume CHPID 61 is on System B, connects to port D1 on the FICON Director, and is dedicated to partition LP1B. For System A, we could specify the following:

```
CNTLUNIT CUNUMBR=4B10,PATH=50,LINK=D0,UNITADD=((40,8)),UNIT=FCTC
CNTLUNIT CUNUMBR=5B10,PATH=51,LINK=D1,UNITADD=((40,8)),UNIT=FCTC
```

For System B, we could specify the following:

```
CNTLUNIT CUNUMBR=4A10,PATH=61,LINK=C1,UNITADD=((40,8)),UNIT=FCTC,CUADD=1
CNTLUNIT CUNUMBR=4A20,PATH=61,LINK=C1,UNITADD=((40,8)),UNIT=FCTC,CUADD=2
CNTLUNIT CUNUMBR=4A30,PATH=61,LINK=C1,UNITADD=((40,8)),UNIT=FCTC,CUADD=3
CNTLUNIT CUNUMBR=5A10,PATH=60,LINK=C0,UNITADD=((40,8)),UNIT=FCTC,CUADD=1
CNTLUNIT CUNUMBR=5A20,PATH=60,LINK=C0,UNITADD=((40,8)),UNIT=FCTC,CUADD=2
CNTLUNIT CUNUMBR=5A30,PATH=60,LINK=C0,UNITADD=((40,8)),UNIT=FCTC,CUADD=3
```

This would result in control unit 4B10 sending data to be received by control units 5A10-5A30 and control units 4A10-4A30 sending data to be received by control unit 5B10.

Defining CTC devices

CTC devices must be defined so that a connection is established between each logical partition.

The following IODEVICE statement example defines 8 CTC devices to the above control unit number 4B10 in System A:

```
IODEVICE ADDRESS=(4B10,8),CUNUMBR=4B10,UNITADD=40,UNIT=FCTC
```

The following IODEVICE statement example defines 8 CTC devices to each of the following control unit numbers 5A10-5A30 in System B:

```
IODEVICE ADDRESS=(5A10,8),CUNUMBR=5A10,UNITADD=40,UNIT=FCTC
IODEVICE ADDRESS=(5A20,8),CUNUMBR=5A20,UNITADD=40,UNIT=FCTC
IODEVICE ADDRESS=(5A30,8),CUNUMBR=5A30,UNITADD=40,UNIT=FCTC
```

All three partitions in System A use devices 4B10-4B17 to communicate with partition LP1B in System B. System B uses devices 5A10-5A17 to communicate with partition LP1A in System A, devices 5A20-5A27 for partition LP2A and devices 5A30-5A37 for partition LP3A. Each pair of CTC devices that are to communicate with each other must have the same unit address.

The following recommendations are useful when assigning unit addresses:

1. Assign the same starting unit address to all CTC CNTLUNIT statements defined to a channel with the same LINK address.
2. Assign the same starting unit address to all CNTLUNIT statements on both ends of a CTC connection.

Using the recommended device numbering method described in Chapter 5, we could assign CTC image IDs of A1 to LP1A, A2 to LP2A, A3 to LP3A and B1 to LP1B. We would also define separate Send and Receive devices. For System A, we could specify the following:

```
IODEVICE ADDRESS=(4B10,8),CUNUMBR=4B10,UNITADD=40,UNIT=FCTC
IODEVICE ADDRESS=(5B10,8),CUNUMBR=5B10,UNITADD=40,UNIT=FCTC
```

For System B, we could specify the following:

```
IODEVICE ADDRESS=(4A10,8),CUNUMBR=4A10,UNITADD=40,UNIT=FCTC
IODEVICE ADDRESS=(4A20,8),CUNUMBR=4A20,UNITADD=40,UNIT=FCTC
IODEVICE ADDRESS=(4A30,8),CUNUMBR=4A30,UNITADD=40,UNIT=FCTC
IODEVICE ADDRESS=(5A10,8),CUNUMBR=5A10,UNITADD=40,UNIT=FCTC
IODEVICE ADDRESS=(5A20,8),CUNUMBR=5A20,UNITADD=40,UNIT=FCTC
IODEVICE ADDRESS=(5A30,8),CUNUMBR=5A30,UNITADD=40,UNIT=FCTC
```

This would result in devices 4B10-4B17 being used to send data to be received by devices 5A10-5A37 and devices 4A10-4A37 being used to send data to be received by devices 5B10-5B17.

Redundant CTC configuration

Minimum configuration

When using a single FICON Director, the minimum number of shared FC channels required to allow any partition to communicate with any other partition is:

```
FC channels = M
        where M = number of processor complexes
```

For unspanned FC channels that are shared on a processor complex that supports multiple logical channel subsystems, the value M above is equal to the total number of logical channel subsystems on the processor complexes.

When using a single FICON Director, the minimum number of unshared FC channels required to allow any partition to communicate with any other partition is:

```
FC channels = n
        where n = number of processor complexes in basic mode
               or number of logical partitions in LPAR mode
```

Channel-redundant configuration

The minimum configuration does not provide for alternative paths. The availability of a CTC communication, in the event of a single channel or FICON Director port failure, can be increased by defining a second shared FC channel for each processor or a second unshared FC channel for each partition. The number of shared FC channels required to allow any partition to communicate with any other partition is:

```
FC channels = 2xM
          where M = number of processor complexes
```

For unspanned FC channels that are shared on a processor complex that supports multiple logical channel subsystems, the value M above is equal to the total number of logical channel subsystems on the processor complexes.

The number of unshared FC channels required to allow any partition to communicate with any other partition is:

```
FC channels = 2xn
          where n = number of processor complexes in basic mode
                 or number of logical partitions in LPAR mode
```

Fully redundant configuration

The previous channel redundant configuration does not provide for FICON Director failure. Full redundancy can be achieved with two FICON Directors, each supporting a minimum CTC configuration. The number of shared FC channels required to allow any partition to communicate with any other partition is:

```
FC channels = 2xM
          where M = number of processor complexes
```

For unspanned FC channels that are shared on a processor complex that supports multiple logical channel subsystems, the value M above is equal to the total number of logical channel subsystems on the processor complexes.

Note: This is the same number of channels as the channel redundant configuration.

The number of unshared FC channels required to allow any partition to communicate with any other partition is:

```
FC channels = 4xn
          where n = number of processor complexes in basic mode
                 or number of logical partitions in LPAR mode
```

Chapter 8. FICON CTC device-specific functions

This chapter describes device-specific functions that the FICON CTC implementation supports.

Sense ID command

The Sense ID command response contains 12 bytes. The first 7 bytes are basic identification information and the next 5 bytes are extended identification information.

Control unit model number (byte 3) =X'1E' indicates that it is a channel with integrated CTC control unit function. Device-model number (byte 6) will always be X'00' for FICON CTC devices since ESCON CTC basic mode is not supported on FICON channels.

Table 6. Sense ID data for a FICON CTC device that supports FICON CTC mode

Sense Byte	Hex Value	Field Description
Byte 0	FF	
Byte 1	30	Control unit type number
Byte 2	88	Control unit type number
Byte 3	1E	Control unit model number
Byte 4	00	Device type number
Byte 5	00	Device type number
Byte 6	00	Device model number
Byte 7	00	
Byte 8	40	
Byte 9	C4	
Byte 10	00	
Byte 11	80	

Beginning with byte 8, a 4-byte command information word is provided. It describes a command that can cause the device to perform a specific operation.

- Byte 8 is a flag indicating that the Read Configuration Data command is supported.
- Byte 9 contains the command code for the Read Configuration Data command.
- Bytes 10–11 contain the data transfer byte count for the read configuration data command.

Read configuration data command

The program sends a Read Configuration Data command, command code X'C4', to read a configuration record that contains information describing the internal configuration of the device.

The 128-byte configuration record consists of four 32-byte fields:
- Node element descriptor (NED) of the node where the CTC function is local (integrated with the channel) for this CTC connection.
- Specific Node Element Qualifier (SNEQ) of the node where the CTC function is remote for this connection.
- Token node element descriptor (token NED)
- General node element qualifier (general NEQ)

See *ESA/390: Common I/O Device Commands*, SA22 7204, for a description of NED and NEQ fields.

Node Element Descriptor (NED)

The sequence number indicator field (bits 3-4 of the flags byte) contains a code of X'01' to indicate that the sequence number in the NED may not be the sequence number of the processor complex. The first 4 bytes of the sequence number field are used for nonsequenced number purposes. See Table 7.

All FICON CTC devices for every FICON CTC channel on a processor complex share the processor complex's sequence number; the last 7 bytes of which are stored in the last 7 bytes (bytes 23-29) of the sequence number field.

The information in bytes 18-21 and bytes 30-31 are needed to make FICON CTC devices NED-unique to an operating system.

Programs sending Read Configuration Data commands to either side of an FICON CTC device receive the same NED data.

The NED has the following format:

Table 7. Contents of Node Element Descriptor

<table>
<tr><th>Word</th><th colspan="5">NED Format</th></tr>
<tr><td>0</td><td>Flags</td><td>Type</td><td>Class</td><td>Reserved.</td><td>Level</td></tr>
<tr><td>1</td><td colspan="5">Type Number</td></tr>
<tr><td>2</td><td colspan="2">Type Number (c)</td><td colspan="3">Model Number</td></tr>
<tr><td>3</td><td>MN (c)</td><td colspan="4">Manufacturer</td></tr>
<tr><td>4</td><td colspan="2">Plant of Mfg.</td><td colspan="3">Sequence Number</td></tr>
<tr><td>5</td><td colspan="5">Sequence Number (c)</td></tr>
<tr><td>6</td><td colspan="5">Sequence Number (c)</td></tr>
<tr><td>7</td><td colspan="2">Sequence No. (c)</td><td colspan="3">Tag</td></tr>
</table>

Flags X’C8’

Type X’01’

Class X’09’

Reserved B’0000000’

Level B’0’

Type number

Characters in EBCDIC code that indicate the machine type for the processor complex to which the FICON channel is configured. For example, X'F0F0F2F0F6F4' is used to indicate a zSeries 900 processor complex.

Model number

Three characters in EBCDIC code that indicate the FICON CTC device model. For FICON CTC devices, X'C3E3C3' (character CTC) is used.

Manufacturer

Three characters in EBCDIC code that indicate the manufacturer of the processor complex to which the FICON CTC channel is configured. X'C9C2D4' indicates IBM.

Plant of manufacture

Two characters in EBCDIC code that indicate the plant of manufacture of the processor complex to which the FICON CTC channel is configured.

Bytes 0–4 of sequence number

These bytes are used for nonsequenced number purposes.

- Bytes 0 -1 on systems z900 and earlier indicate the link address in EBCDIC of the FICON channel.
- Bytes 0 -1 on systems z990 and later indicate the Inbound CSSID.IID in EBCDIC
- Byte 2 contents on systems z900 and earlier depend on whether the FICON channel is shared:
  - If the FICON channel is shared, byte 2 indicates the logical partition number on the local channel side of the CTC communication associated with the device.
  - If the FICON channel is not shared, byte 2 indicates the partition number 0 in X'F0' EBCDIC code is indicated.
- Byte 2 on systems z990 and later indicates the Outbound CSSID in EBCDIC
- Byte 3 contents on systems z900 and earlier depend on whether the FICON channel is shared:
  - If the FICON channel is shared, byte 3 indicates the logical partition number on the remote FICON channel side of the CTC communication associated with the device.
  - If the FICON channel is not shared, byte 3 indicates partition number 0 in X'F0' EBCDIC code.
- Byte 3 on systems z990 and later indicates the Outbound IID in EBCDIC
- Byte 4:
  - Contains a value of "C1" (or EBCDIC "A") if this NED is describing the channel that issued the Read Configuration Data command.
  - Contains a value of "C2" (or EBCDIC "B") if this NED is describing the channel to which the channel that issued the command is connected.

Bytes 5–11 of the sequence number

Characters in EBCDIC code indicating the last 7 bytes of the sequence number for the processor complex to which the FICON channel is configured.

Tag

Two bytes, as follows:

- Byte 1 on systems z900 and earlier indicates the physical channel number on the processor complex to which the FICON channel is configured.
- Byte 1 on systems z990 and later is currently reserved at 0 for future expansion.
- Byte 2 indicates the unit address used for this CTC access, which is the same for both sides of the CTC connection.

Specific Node Element Qualifier (SNEQ)

The sequence number indicator field (bits 3-4 of the flags byte) contains a code of X'01' to indicate that the sequence number in the SNEQ may not be the sequence number of the processor complex. The first 4 bytes of the sequence number field are used for nonsequenced number purposes. See 8

All FICON CTC devices for every FICON CTC channel on a processor complex share the processor complex's sequence number; the last 7 bytes of which are stored in the last 7 bytes (bytes 23-29) of the sequence number field.

The information in bytes 18-21 and bytes 30-31 are needed to make FICON CTC devices SNEQ-unique to an operating system.

Programs sending Read Configuration Data commands to either side of an FICON CTC device receive the same NED data.

The SNEQ has the following format:

Table 8. Contents of Specific Node Element Qualifier

Word	SNEQ Format			
0	Flags	Reserved		
1	Type Number			
2	Type Numbers (c)		Model Numbers	
3	MN (c)	Manufacturer		
4	Plant of Mfg.		Sequence Number	
5	Sequence Number (c)			
6	Sequence Number (c)			
7	Sequence Number (c)		Tag	

Flags X’40’

Reserved X’000000’

Type number

Characters in EBCDIC code that indicate the machine type for the processor complex to which the FICON channel is configured. For example, X'F0F0F2F0F6F4' is used to indicate a zSeries 900 processor complex.

Model number

Three characters in EBCDIC code that indicate the FICON CTC device model. For FICON CTC devices, X'C3E3C3' (character CTC) is used.

Manufacturer

Three characters in EBCDIC code that indicate the manufacturer of the processor complex to which the FICON CTC channel is configured. X'C9C2D4' indicates IBM.

Plant of manufacture

Two characters in EBCDIC code that indicate the plant of manufacture of the processor complex to which the FICON CTC channel is configured.

Bytes 0–4 of sequence number

These bytes are used for nonsequenced number purposes.

- Bytes 0–1 on systems z900 and earlier indicate the link address in EBCDIC of the FICON channel.
- Bytes 0 - 1 on systems z990 and later indicate the Inbound CSSID.IID from Remote Node Descriptor in EBCDIC
- Byte 2 contents on systems z900 and earlier depend on whether the FICON channel is shared:
  - If the FICON channel is shared, byte 2 indicates the logical partition number on the remote channel side of the CTC communication associated with the device.
  - If the FICON channel is not shared, byte 2 indicates the partition number 0 in X'F0' EBCDIC code is indicated.
- Byte 2 on systems z990 and later indicates the Outbound CSSID from Remote Node Descriptor in EBCDIC
- Byte 3 contents on systems z900 and earlier depend on whether the FICON channel is shared:
  - If the FICON channel is shared, byte 3 indicates the logical partition number on the local FICON channel side of the CTC communication associated with the device.
  - If the FICON channel is not shared, byte 3 indicates partition number 0 in X'F0' EBCDIC code.
- Byte 3 on systems z990 and later indicate the Outbound IID from Remote Node Descriptor in EBCDIC
- Byte 4:

– Contains a value of "C1" (or EBCDIC "A") if this SNEQ is describing the channel that issued the Read Configuration Data command.
– Contains a value of "C2" (or EBCDIC "B") if this SNEQ is describing the channel to which the channel that issued the command is connected.

Bytes 5–11 of the sequence number

Characters in EBCDIC code indicating the last 7 bytes of the sequence number for the processor complex to which the FICON channel is configured.

Tag

Two bytes, as follows:
- Byte 1 on systems z900 and earlier indicates the physical channel number on the processor complex to which the FICON channel is configured.
- Byte 1 on systems z990 and later is currently reserved at 0 for future expansion.
- Byte 2 indicates the unit address used for this CTC access, which is the same for both sides of the CTC connection.

Token Node Element Descriptor (Token NED)

The serial number contained in the token NED is the 10-byte serial number of the processor complex to which the FICON CTC channel is configured. The serial number indicator field of the flags byte has a value of X'10'.

The configuration data for each FICON CTC device for an FICON CTC channel has the same token NED.

The token NED has the following format:

Table 9. Contents of Token Node Element Descriptor

<table>
<tr><th>Word</th><th colspan="5">Token NED Format</th></tr>
<tr><td>0</td><td>Flags</td><td>Type</td><td>Class</td><td>Reserved</td><td>L</td></tr>
<tr><td>1</td><td colspan="5">Type Number</td></tr>
<tr><td>2</td><td colspan="2">Type Number (c)</td><td colspan="3">Model Number</td></tr>
<tr><td>3</td><td>MN (c)</td><td colspan="4">Manufacturer</td></tr>
<tr><td>4</td><td colspan="2">Plant of Manufacturing</td><td colspan="3">Sequence Number</td></tr>
<tr><td>5</td><td colspan="5">Sequence Number (c)</td></tr>
<tr><td>6</td><td colspan="5">Sequence Number (c)</td></tr>
<tr><td>7</td><td colspan="2">Sequence Number (c)</td><td colspan="3">Tag</td></tr>
</table>

Flags X’C8’

Type X’01’

Class X’09’

Reserved B’0000000’

Level B’0’

Type number

Characters in EBCDIC code that indicate the machine type for the processor complex to which the FICON channel is configured. For example, X'F0F0F2F0F6F4' is used to indicate a zSeries 900 processor complex.

Model number

Three characters in EBCDIC code that indicate the FICON CTC device model. For FICON CTC devices, X'C3E3C3' (character CTC) is used.

Manufacturer

Three characters in EBCDIC code that indicate the manufacturer of the processor complex to which the FICON CTC channel is configured. X'C9C2D4' indicates IBM.

Plant of manufacture

Two characters in EBCDIC code that indicate the plant of manufacture of the processor complex to which the FICON CTC channel is configured.

Sequence number

Ten characters in EBCDIC code that indicate the sequence number for the processor complex to which the FICON CTC channel is configured.

Tag

- Byte 1 on systems z900 and earlier is X’00’
- Byte 1 on systems z990 and later contains the CSSID Mask
- Byte 2 on systems z900 and earlier indicates the physical channel number on the processor complex to which the FICON CTC channel is configured.
- Byte 2 on systems z990 and later indicates the CHPID

General Node Element Qualifier (NEQ)

The general NEQ has the following format:

Table 10. Contents of General Node Element Qualifier

Word	NED Format		
0	Flags	RS	Interface ID
1	Reserved		
2	X ’00000000’		
3	X ’00000000’		
4	X ’00000000’		
5	X ’00000000’		
6	X ’00000000’		
7	X ’00000000’		

Flag
X’80"

RS
X’00’

Interface ID

- Byte 1 is X’00’
- Byte 2 is:
  - X'01' if the configuration record is requested by the system to which the CTC function is local.
  - X'02' if the record is requested by the system to which the CTC function is remote

Reserved
X’00000000’

Data chaining

The data chaining function is not supported by the FICON CTC channel. If a FICON CTC device receives a command frame with the chain data flag set, the command is rejected with unit check status. Bit 0 (command reject bit) of sense byte 0 is set to 1 to indicate this condition.

Error reporting

The FICON channel CTC function reports errors and unusual conditions to the control program by presenting both 'unit check' status and the proper ending status. The causes of the errors are indicated in the sense bytes which can be retrieved by the Sense Adapter State command.

The FICON channel CTC function does not use the supplemental status frame which is defined in the ESCON I/O Interface architecture.

Appendix A. ESCON configuration examples

This appendix contains several examples to illustrate various ESCON CTC configuration. IOCP statements included with each figure show the correct way to code the configuration.

ESCON CTC point-to-point

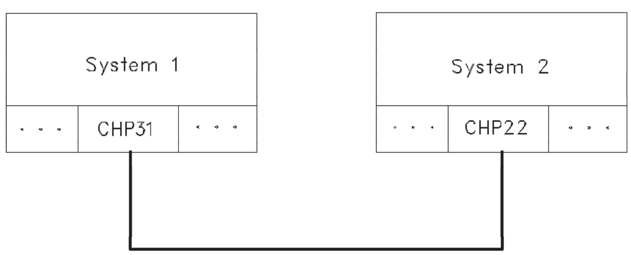

Figure 23. ESCON CTC point-to-point

IOCP statements for system 1 configuration

```
CHPID PATH=(31),TYPE=CTC

CNTLUNIT CUNUMBR=000,PATH=(31),UNITADD=((00,1)),UNIT=SCTC

IODEVICE ADDRESS=100,CUNUMBR=000,UNIT=SCTC
```

IOCP statements for System 2 configuration

```
CHPID PATH=(22),TYPE=CNC

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 systems to communicate with each other (00 in this example).

ESCON CTC dynamic through an ESCON director with multiple paths

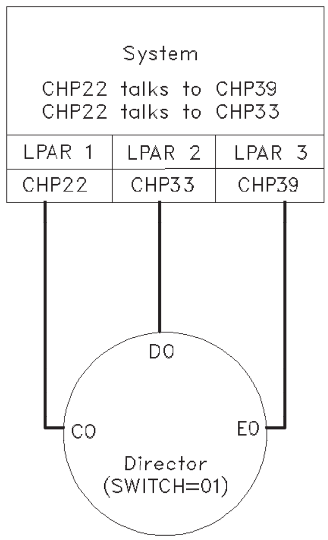

Figure 24. ESCON CTC dynamic through an ESCON director with multiple paths

IOCP statements for the configuration

```
CHPID PATH=(22),TYPE=CTC,SWITCH=01,PART=LPAR1
CHPID PATH=(33),TYPE=CNC,SWITCH=01,PART=LPAR2
CHPID PATH=(39),TYPE=CNC,SWITCH=01,PART=LPAR3

CNTLUNIT CUNUMBR=000,PATH=(22),UNITADD=((00,1)),UNIT=SCTC,      X
              LINK=D0

CNTLUNIT CUNUMBR=001,PATH=(22),UNITADD=((10,1)),UNIT=SCTC,      X
              LINK=E0

IODEVICE ADDRESS=100,CUNUMBR=000,UNIT=SCTC
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 systems 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.

Non-MIF to non-MIF point-to-point

Eight CTC communications exist between *chpid* 50 in System A and *chpid* 60 in System B. This is a point-to-point configuration without going through an ESCON Director. See Figure 25.

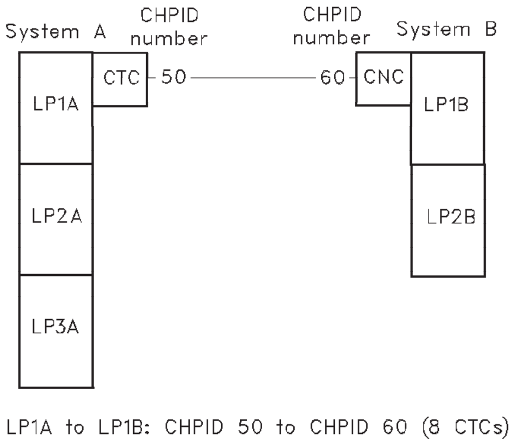

Figure 25. Non-MIF to non-MIF point-to-point

IOCP statements for system A (non-MIF)

```
CHPID PATH=50,TYPE=CTC,PART=LP1A

**************************************************************
* CTC connection between LP1A and LP1B
*
* Define a control unit representing destination channel CHPID 60 (CNC)
* to source channel CHPID 50 (CTC).
CNTLUNIT CUNUMBR=5010,PATH=50,UNITADD=((40,8)),UNIT=SCTC
IODEVICE ADDRESS=(5010,8),CUNUMBR=5010,UNITADD=40,UNIT=SCTC
```

IOCP statements for system B (non-MIF

```
CHPID PATH=60,TYPE=CNC,PART=LP1B

**************************************************************
* CTC connection between LP1B and LP1A
*
* Define a control unit representing destination channel CHPID 50 (CTC)
* to source channel CHPID 60 (CNC).
CNTLUNIT CUNUMBR=6010,PATH=60,UNITADD=((40,8)),UNIT=SCTC
IODEVICE ADDRESS=(6010,8),CUNUMBR=6010,UNITADD=40,UNIT=SCTC
```

Non-MIF wrap-around point-to-point

Six CTC communications exist between *chpid* 50 and *chpid* 51 in System A. The two channels of a CTC connection are in the same CPC to support CTC communications between logical partitions in PR/SM. See Figure 26.

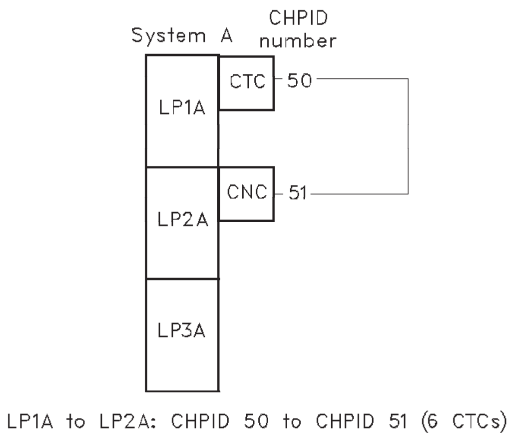

Figure 26. Non-MIF wrap-around point-to-point

IOCP statements for system A (non-MIF)

```
CHPID PATH=50,TYPE=CTC,PART=LP1A
CHPID PATH=51,TYPE=CNC,PART=LP2A

*************************************************************
* CTC connection between LP1A and LP2A
*
* Define a control unit representing destination channel CHPID 51 (CNC)
* to source channel CHPID 50 (CTC).
CNTLUNIT CUNUMBR=5020,PATH=50,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5020,6),CUNUMBR=5020,UNITADD=40,UNIT=SCTC
*
* Define a control unit representing destination channel CHPID 50 (CTC)
* to source channel CHPID 51 (CNC).
CNTLUNIT CUNUMBR=5110,PATH=51,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5110,6),CUNUMBR=5110,UNITADD=40,UNIT=SCTC
```

Non-MIF to non-MIF (example A)

Two partitions LP1A and LP2A in System A and one partition LP1B in System B participate in an any-to-any CTC configuration. Any-to-any configuration means CTC connections from any partition to any other partition. Six CTC communications exist for each CTC connection. This is a minimum configuration. See Figure 27.

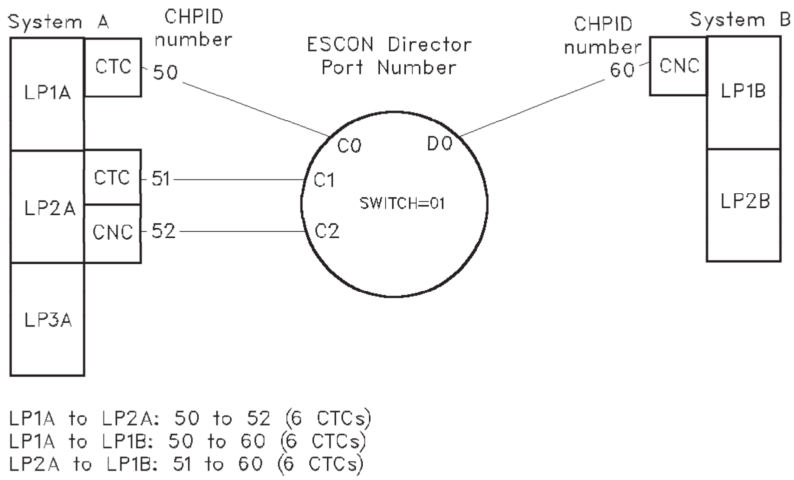

Figure 27. Non-MIF to non-MIF (Example A)

IOCP statements for system A (non-MIF)

```
CHPID PATH=50,TYPE=CTC,PART=LP1A,SWITCH=01
CHPID PATH=51,TYPE=CTC,PART=LP2A,SWITCH=01
CHPID PATH=52,TYPE=CNC,PART=LP2A,SWITCH=01

**************************************************************
* CTC wrap-around connection between LP1A and LP2A
*
* Define a control unit representing destination channel CHPID 52 (CNC)
* to source channel CHPID 50 (CTC).
CNTLUNIT CUNUMBR=5020,PATH=50,LINK=C2,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5020,6),CUNUMBR=5020,UNITADD=40,UNIT=SCTC
*
* Define a control unit representing destination channel CHPID 50 (CTC)
* to source channel CHPID 52 (CNC).
CNTLUNIT CUNUMBR=5210,PATH=52,LINK=C0,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5210,6),CUNUMBR=5210,UNITADD=40,UNIT=SCTC
*****************************************************************
* CTC connection between LP1A and LP1B
*
* Define a control unit representing destination channel CHPID 60 (CNC)
* to source channel CHPID 50 (CTC).
CNTLUNIT CUNUMBR=5010,PATH=50,LINK=D0,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5010,6),CUNUMBR=5010,UNITADD=40,UNIT=SCTC
*****************************************************************
* CTC connection between LP2A and LP1B
*
* Define a control unit representing destination channel CHPID 60 (CNC)
* to source channel CHPID 51 (CTC).
CNTLUNIT CUNUMBR=5110,PATH=51,LINK=D0,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5110,6),CUNUMBR=5110,UNITADD=40,UNIT=SCTC
```

IOCP Statements for System B (non-MIF)

```
CHPID PATH=60,TYPE=CNC,PART=LP1B,SWITCH=01

*****************************************************************
* CTC connection between LP1B and LP1A
*
* Define a control unit representing destination channel CHPID 50 (CTC)
* to source channel CHPID 60 (CNC).
CNTLUNIT CUNUMBR=6010,PATH=60,LINK=C0,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(6010,6),CUNUMBR=6010,UNITADD=40,UNIT=SCTC
*****************************************************************
* CTC connection between LP1B and LP2A
*
* Define a control unit representing destination channel CHPID 51 (CTC)
* to source channel CHPID 60 (CNC).
CNTLUNIT CUNUMBR=6020,PATH=60,LINK=C1,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(6020,6),CUNUMBR=6020,UNITADD=40,UNIT=SCTC
```

Non-MIF to non-MIF (example B)

All five logical partitions (LPs) in the figure participate in an any-to-any CTC configuration. Six CTC communications exist for each CTC connection. This is a minimum configuration. See Figure 28.

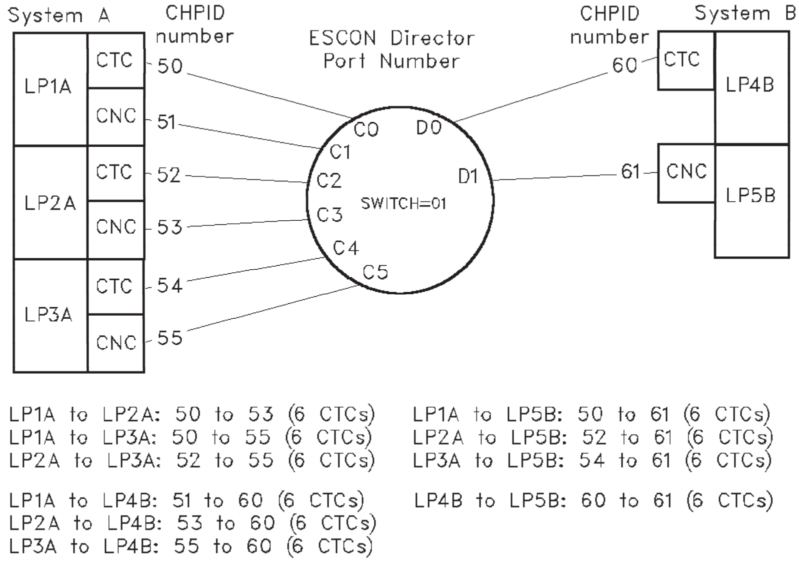

Figure 28. Non-MIF to non-MIF (example B)

IOCP Statements for System A (Non-MIF)

```
CHPID PATH=50,TYPE=CTC,PART=LP1A,SWITCH=01
CHPID PATH=51,TYPE=CNC,PART=LP1A,SWITCH=01
CHPID PATH=52,TYPE=CTC,PART=LP2A,SWITCH=01
CHPID PATH=53,TYPE=CNC,PART=LP2A,SWITCH=01
CHPID PATH=54,TYPE=CTC,PART=LP3A,SWITCH=01
CHPID PATH=55,TYPE=CNC,PART=LP3A,SWITCH=01

*************************************************************
* CTC wrap-around connections among LP1A, LP2A, and LP3A
*
* Define a control unit representing destination channel CHPID 53 (CNC)
* to source channel CHPID 50 (CTC).
CNTLUNIT CUNUMBR=5020,PATH=50,LINK=C3,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5020,6),CUNUMBR=5020,UNITADD=40,UNIT=SCTC
* Define a control unit representing destination channel CHPID 55 (CNC)
* to source channel CHPID 50 (CTC).
CNTLUNIT CUNUMBR=5030,PATH=50,LINK=C5,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5030,6),CUNUMBR=5030,UNITADD=40,UNIT=SCTC
*
* Define a control unit representing destination channel CHPID 55 (CNC)
* to source channel CHPID 52 (CTC).
CNTLUNIT CUNUMBR=5230,PATH=52,LINK=C5,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5230,6),CUNUMBR=5230,UNITADD=40,UNIT=SCTC
*
* Define a control unit representing destination channel CHPID 50 (CTC)
* to source channel CHPID 53 (CNC).
CNTLUNIT CUNUMBR=5310,PATH=53,LINK=C0,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5310,6),CUNUMBR=5310,UNITADD=40,UNIT=SCTC
*
* Define a control unit representing destination channel CHPID 50 (CTC)
* to source channel CHPID 55 (CNC).
CNTLUNIT CUNUMBR=5510,PATH=55,LINK=C0,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5510,6),CUNUMBR=5510,UNITADD=40,UNIT=SCTC
* Define a control unit representing destination channel CHPID 52 (CTC)
```

```
* to source channel CHPID 55 (CNC).
CNTLUNIT CUNUMBR=5520,PATH=55,LINK=C2,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5520,6),CUNUMBR=5520,UNITADD=40,UNIT=SCTC
*****************************************************************
* CTC connection between LP1A and LP4B
*
* Define a control unit representing destination channel CHPID 60 (CTC)
* to source channel CHPID 51 (CNC).
CNTLUNIT CUNUMBR=5140,PATH=51,LINK=D0,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5140,6),CUNUMBR=5140,UNITADD=40,UNIT=SCTC
*****************************************************************
* CTC connection between LP2A and LP4B
*
* Define a control unit representing destination channel CHPID 60 (CTC)
* to source channel CHPID 53 (CNC).
CNTLUNIT CUNUMBR=5340,PATH=53,LINK=D0,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5340,6),CUNUMBR=5340,UNITADD=40,UNIT=SCTC
*****************************************************************
* CTC connection between LP3A and LP4B
*
* Define a control unit representing destination channel CHPID 60 (CTC)
* to source channel CHPID 55 (CNC).
CNTLUNIT CUNUMBR=5540,PATH=55,LINK=D0,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5540,6),CUNUMBR=5540,UNITADD=40,UNIT=SCTC
*****************************************************************
* CTC connection between LP1A and LP5B
*
* Define a control unit representing destination channel CHPID 61 (CNC)
* to source channel CHPID 50 (CTC).
CNTLUNIT CUNUMBR=5050,PATH=50,LINK=D1,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5050,6),CUNUMBR=5050,UNITADD=40,UNIT=SCTC
*****************************************************************
* CTC connection between LP2A and LP5B
*
* Define a control unit representing destination channel CHPID 61 (CNC)
* to source channel CHPID 52 (CTC).
CNTLUNIT CUNUMBR=5250,PATH=52,LINK=D1,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5250,6),CUNUMBR=5250,UNITADD=40,UNIT=SCTC
*****************************************************************
* CTC connection between LP3A and LP5B
*
* Define a control unit representing destination channel CHPID 61 (CNC)
* to source channel CHPID 54 (CTC).
CNTLUNIT CUNUMBR=5450,PATH=54,LINK=D1,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5450,6),CUNUMBR=5450,UNITADD=40,UNIT=SCTC
```

IOCP Statements for System B (Non-MIF)

```
CHPID PATH=60,TYPE=CTC,PART=LP4B,SWITCH=01
CHPID PATH=61,TYPE=CNC,PART=LP5B,SWITCH=01

*****************************************************************
* CTC wrap-around connection between LP4B and LP5B
*
* Define a control unit representing destination channel CHPID 61 (CNC)
* to source channel CHPID 60 (CTC).
CNTLUNIT CUNUMBR=6050,PATH=60,LINK=D1,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(6050,6),CUNUMBR=6050,UNITADD=40,UNIT=SCTC
* Define a control unit representing destination channel CHPID 60 (CTC)
* to source channel CHPID 61 (CNC).
CNTLUNIT CUNUMBR=6140,PATH=61,LINK=D0,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(6140,6),CUNUMBR=6140,UNITADD=40,UNIT=SCTC
.*
*****************************************************************
* CTC connection between LP4B and LP1A
*
* Define a control unit representing destination channel CHPID 51 (CNC)
```

```
* to source channel CHPID 60 (CTC).
.*
CNTLUNIT CUNUMBR=6010,PATH=60,LINK=C1,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(6010,6),CUNUMBR=6010,UNITADD=40,UNIT=SCTC
.*
*****************************************************************
.*
*****************************************************************
* CTC connection between LP4B and LP2A
*
* Define a control unit representing destination channel CHPID 53 (CNC)
* to source channel CHPID 60 (CTC).
CNTLUNIT CUNUMBR=6020,PATH=60,LINK=C3,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(6020,6),CUNUMBR=6020,UNITADD=40,UNIT=SCTC
*****************************************************************
* CTC connection between LP4B and LP3A
*
* Define a control unit representing destination channel CHPID 55 (CNC)
* to source channel CHPID 60 (CTC).
CNTLUNIT CUNUMBR=6030,PATH=60,LINK=C5,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(6030,6),CUNUMBR=6030,UNITADD=40,UNIT=SCTC
*****************************************************************
* CTC connection between LP5B and LP1A
*
* Define a control unit representing destination channel CHPID 50 (CTC)
* to source channel CHPID 61 (CNC).
CNTLUNIT CUNUMBR=6110,PATH=61,LINK=C0,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(6110,6),CUNUMBR=6110,UNITADD=40,UNIT=SCTC
*****************************************************************
* CTC connection between LP5B and LP2A
*
* Define a control unit representing destination channel CHPID 52 (CTC)
* to source channel CHPID 61 (CNC).
CNTLUNIT CUNUMBR=6120,PATH=61,LINK=C2,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(6120,6),CUNUMBR=6120,UNITADD=40,UNIT=SCTC
*****************************************************************
* CTC connection between LP5B and LP3A
*
* Define a control unit representing destination channel CHPID 54 (CTC)
* to source channel CHPID 61 (CNC).
CNTLUNIT CUNUMBR=6130,PATH=61,LINK=C4,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(6130,6),CUNUMBR=6130,UNITADD=40,UNIT=SCTC
```

Non-MIF to non-MIF (channel-redundant)

This configuration provides channel redundancy in the event of a single channel or ESCON Director port failure. In Figure 27 on page 64 (Non-MIF to Non-MIF), if channel 50 or port C0 fails, all CTC communications with partitions LP1A are lost. Each participating partition has one CTC channel and one CNC channel attached to the same ESCON Director.

Without redundancy, six CTC communications are to be defined from any partition to any other partition. With channel redundancy, 12 CTC communications are defined over two CTC connections. See Figure 29 on page 69.

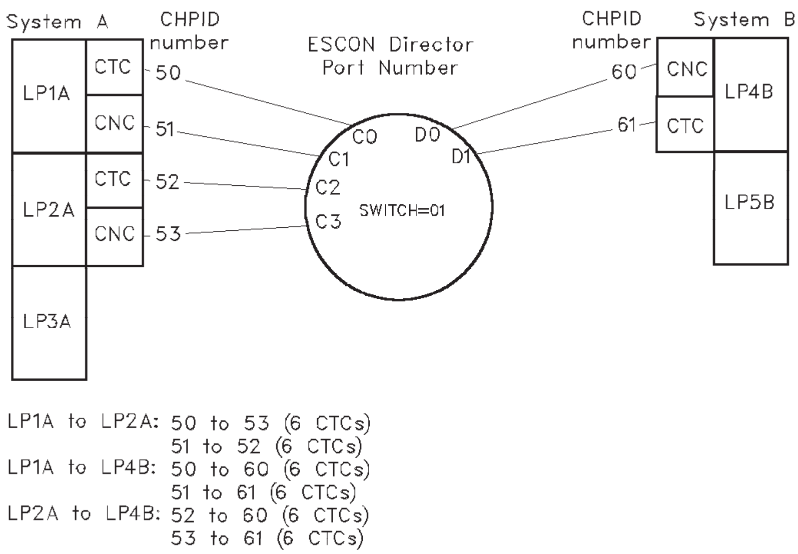

Figure 29. Non-MIF to non-MIF (channel redundant)

IOCP statements for system A (non-MIF)

```
CHPID PATH=50,TYPE=CTC,PART=LP1A,SWITCH=01
CHPID PATH=51,TYPE=CNC,PART=LP1A,SWITCH=01
CHPID PATH=52,TYPE=CTC,PART=LP2A,SWITCH=01
CHPID PATH=53,TYPE=CNC,PART=LP2A,SWITCH=01

*********************************************************************
* CTC channel-redundant wrap-around connections between LP1A and LP2A
*
* Define a control unit representing destination channel CHPID 53 (CNC)
* to source channel CHPID 50 (CTC).
CNTLUNIT CUNUMBR=5020,PATH=50,LINK=C3,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5020,6),CUNUMBR=5020,UNITADD=40,UNIT=SCTC
*
* Define a control unit representing destination channel CHPID 52 (CTC)
* to source channel CHPID 51 (CNC).
CNTLUNIT CUNUMBR=5120,PATH=51,LINK=C2,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5120,6),CUNUMBR=5120,UNITADD=40,UNIT=SCTC
*
* Define a control unit representing destination channel CHPID 50 (CTC)
* to source channel CHPID 53 (CNC).
CNTLUNIT CUNUMBR=5310,PATH=53,LINK=C0,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5310,6),CUNUMBR=5310,UNITADD=40,UNIT=SCTC
*
* Define a control unit representing destination channel CHPID 51 (CNC)
* to source channel CHPID 52 (CTC).
CNTLUNIT CUNUMBR=5210,PATH=52,LINK=C1,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5210,6),CUNUMBR=5210,UNITADD=40,UNIT=SCTC
********************************************************************
* CTC channel-redundant connections between LP1A and LP4B
*
* Define a control unit representing destination channel CHPID 60 (CNC)
* to source channel CHPID 50 (CTC).
CNTLUNIT CUNUMBR=5040,PATH=50,LINK=D0,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5040,6),CUNUMBR=5040,UNITADD=40,UNIT=SCTC
*
* Define a control unit representing destination channel CHPID 61 (CTC)
* to source channel CHPID 51 (CNC).
CNTLUNIT CUNUMBR=5140,PATH=51,LINK=D1,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5140,6),CUNUMBR=5140,UNITADD=40,UNIT=SCTC
```

```
*********************************************************************
* CTC channel-redundant connections between LP2A and LP4B
*
* Define a control unit representing destination channel CHPID 60 (CNC)
* to source channel CHPID 52 (CTC).
CNTLUNIT CUNUMBR=5240,PATH=52,LINK=D0,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5240,6),CUNUMBR=5240,UNITADD=40,UNIT=SCTC
*
* Define a control unit representing destination channel CHPID 61 (CTC)
* to source channel CHPID 53 (CNC).
CNTLUNIT CUNUMBR=5340,PATH=53,LINK=D1,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5340,6),CUNUMBR=5340,UNITADD=40,UNIT=SCTC
```

IOCP statements for system B (non-MIF)

```
CHPID PATH=60,TYPE=CNC,PART=LP4B,SWITCH=01
CHPID PATH=61,TYPE=CTC,PART=LP4B,SWITCH=01

*****************************************************************
* CTC channel-redundant connections between LP4B and LP1A
*
* Define a control unit representing destination channel CHPID 50 (CTC)
* to source channel CHPID 60 (CNC).
*
CNTLUNIT CUNUMBR=6010,PATH=60,LINK=C0,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(6010,6),CUNUMBR=6010,UNITADD=40,UNIT=SCTC
* Define a control unit representing destination channel CHPID 51 (CNC)
* to source channel CHPID 61 (CTC).
*
CNTLUNIT CUNUMBR=6110,PATH=61,LINK=C1,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(6110,6),CUNUMBR=6110,UNITADD=40,UNIT=SCTC
*****************************************************************
* CTC channel-redundant connections between LP4B and LP2A
*
* Define a control unit representing destination channel CHPID 52 (CTC)
* to source channel CHPID 60 (CNC).
*
CNTLUNIT CUNUMBR=6020,PATH=60,LINK=C2,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(6020,6),CUNUMBR=6020,UNITADD=40,UNIT=SCTC
* Define a control unit representing destination channel CHPID 53 (CNC)
* to source channel CHPID 61 (CTC).
*
CNTLUNIT CUNUMBR=6120,PATH=61,LINK=C3,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(6120,6),CUNUMBR=6120,UNITADD=40,UNIT=SCTC
```

Non-MIF to non-MIF (fully redundant)

This configuration provides full redundancy from any partition to any other partition. In Figure 29 on page 69 (Non-MIF to Non-MIF), if the ESCON Director fails, all CTC communications are lost.

After defining CTC connections associated with Switch 01, it becomes advantageous to allocate CTC and CNC channels differently among partitions for Switch 02 configuration. This evenly allocates channels among partitions for CTC communication. See Figure 30 on page 71.

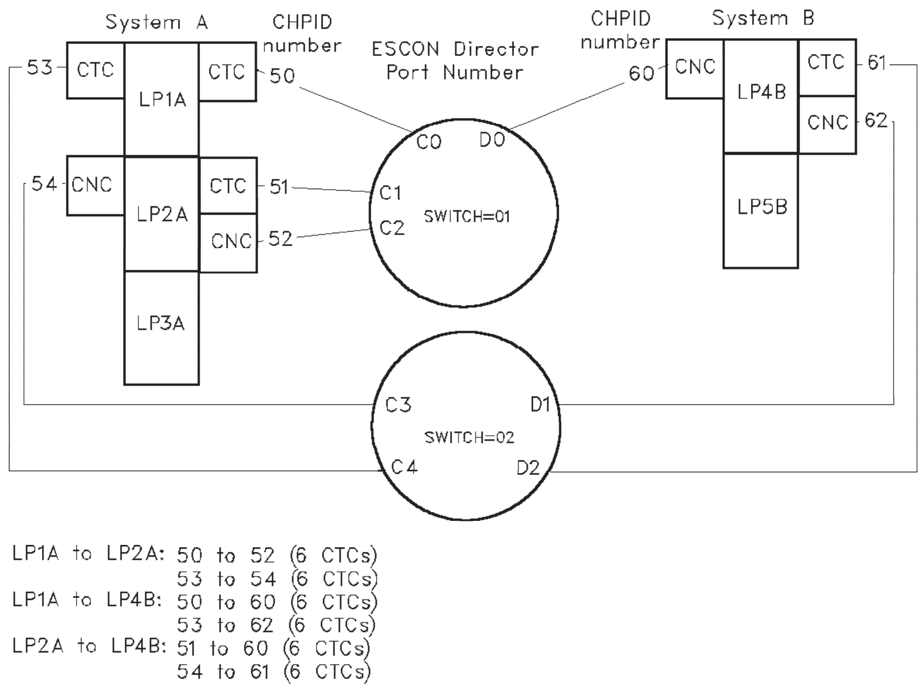

Figure 30. Non-MIF to non-MIF (fully redundant)

IOCP statements for system A (non-MIF)

```
CHPID PATH=50,TYPE=CTC,PART=LP1A,SWITCH=01
CHPID PATH=51,TYPE=CTC,PART=LP2A,SWITCH=01
CHPID PATH=52,TYPE=CNC,PART=LP2A,SWITCH=01
CHPID PATH=53,TYPE=CTC,PART=LP1A,SWITCH=02
CHPID PATH=54,TYPE=CNC,PART=LP2A,SWITCH=02

***********************************
* First any-to-any with Switch 01 *
***********************************
*
**************************************************************
* CTC wrap-around connection between LP1A and LP2A
*
* Define a control unit representing destination channel CHPID 52 (CNC)
* to source channel CHPID 50 (CTC).
CNTLUNIT CUNUMBR=5020,PATH=50,LINK=C2,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5020,6),CUNUMBR=5020,UNITADD=40,UNIT=SCTC
*
* Define a control unit representing destination channel CHPID 50 (CTC)
* to source channel CHPID 52 (CNC).
CNTLUNIT CUNUMBR=5210,PATH=52,LINK=C0,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5210,6),CUNUMBR=5210,UNITADD=40,UNIT=SCTC
*****************************************************************
* CTC connection between LP1A and LP4B
*
* Define a control unit representing destination channel CHPID 60 (CNC)
* to source channel CHPID 50 (CTC).
CNTLUNIT CUNUMBR=5040,PATH=50,LINK=D0,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5040,6),CUNUMBR=5040,UNITADD=40,UNIT=SCTC
*****************************************************************
* CTC connection between LP2A and LP4B
*
* Define a control unit representing destination channel CHPID 60 (CNC)
* to source channel CHPID 51 (CTC).
```

```
CNTLUNIT CUNUMBR=5140,PATH=51,LINK=D0,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5140,6),CUNUMBR=5140,UNITADD=40,UNIT=SCTC
************************************
* Second any-to-any with Switch 02 *
************************************
*
***************************************************************
* CTC wrap-around connection between LP1A and LP2A
*
* Define a control unit representing destination channel CHPID 54 (CNC)
* to source channel CHPID 53 (CTC).
CNTLUNIT CUNUMBR=5320,PATH=53,LINK=C3,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5320,6),CUNUMBR=5320,UNITADD=40,UNIT=SCTC
*
* Define a control unit representing destination channel CHPID 53 (CTC)
* to source channel CHPID 54 (CNC).
CNTLUNIT CUNUMBR=5410,PATH=54,LINK=C4,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5410,6),CUNUMBR=5410,UNITADD=40,UNIT=SCTC
******************************************************************
* CTC connection between LP1A and LP4B
*
* Define a control unit representing destination channel CHPID 62 (CNC)
* to source channel CHPID 53 (CTC).
CNTLUNIT CUNUMBR=5340,PATH=53,LINK=D1,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5340,6),CUNUMBR=5340,UNITADD=40,UNIT=SCTC
******************************************************************
* CTC connection between LP2A and LP4B
*
* Define a control unit representing destination channel CHPID 61 (CTC)
* to source channel CHPID 54 (CNC).
CNTLUNIT CUNUMBR=5440,PATH=54,LINK=D2,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5440,6),CUNUMBR=5440,UNITADD=40,UNIT=SCTC
```

IOCP statements for system B (non-MIF)

```
CHPID PATH=60,TYPE=CNC,PART=LP4B,SWITCH=01
CHPID PATH=61,TYPE=CTC,PART=LP4B,SWITCH=02
CHPID PATH=62,TYPE=CNC,PART=LP4B,SWITCH=02

***********************************
* First any-to-any with Switch 01 *
***********************************
*
******************************************************************
* CTC connection between LP4B and LP1A
*
* Define a control unit representing destination channel CHPID 50 (CTC)
* to source channel CHPID 60 (CNC).
CNTLUNIT CUNUMBR=6010,PATH=60,LINK=C0,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(6010,6),CUNUMBR=6010,UNITADD=40,UNIT=SCTC
******************************************************************
* CTC connection between LP4B and LP2A
*
* Define a control unit representing destination channel CHPID 51 (CTC)
* to source channel CHPID 60 (CNC).
CNTLUNIT CUNUMBR=6020,PATH=60,LINK=C1,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(6020,6),CUNUMBR=6020,UNITADD=40,UNIT=SCTC

************************************
* Second any-to-any with Switch 02 *
************************************
*
******************************************************************
* CTC connection between LP4B and LP1A
*
* Define a control unit representing destination channel CHPID 53 (CTC)
* to source channel CHPID 62 (CNC).
```

```
CNTLUNIT CUNUMBR=6210,PATH=62,LINK=C4,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(6210,6),CUNUMBR=6210,UNITADD=40,UNIT=SCTC
*****************************************************************
* CTC connection between LP4B and LP2A
*
* Define a control unit representing destination channel CHPID 54 (CNC)
* to source channel CHPID 61 (CTC).
CNTLUNIT CUNUMBR=6120,PATH=61,LINK=C3,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(6120,6),CUNUMBR=6120,UNITADD=40,UNIT=SCTC
```

Non-MIF wrap-around (fully redundant CTC ring)

This configuration defines CTC connections which forms two rings among four partitions. Each ring associated with a separate ESCON Director allows a logical partition to connect to the next partition in the ring position; this is, LP1A to LP2A to LP3A to LP4A and back to LP1A. It does not provide any partition to any other partition connections. See Figure 31.

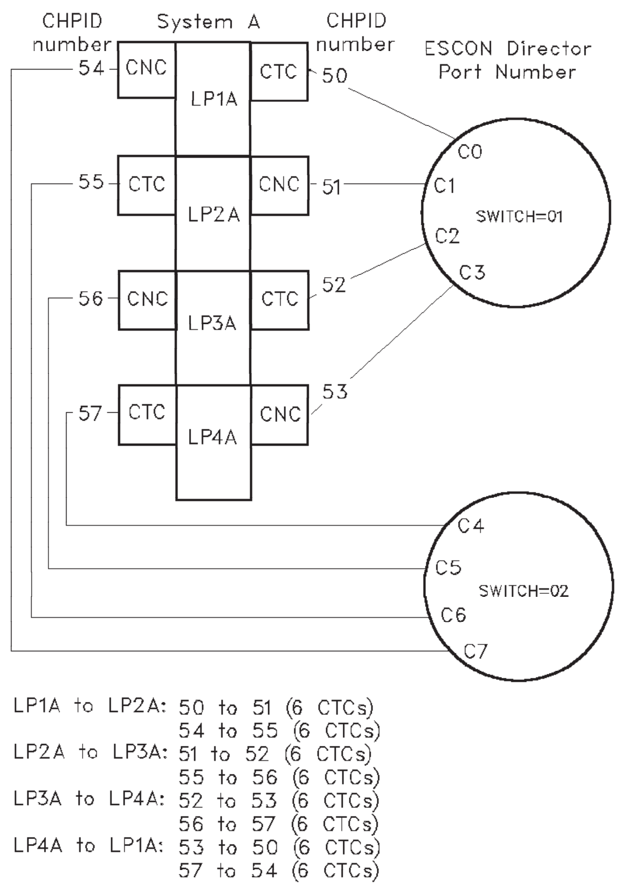

Figure 31. Non-MIF wrap-around (fully redundant CTC ring)

IOCP statements for system A (non-MIF)

```
CHPID PATH=50,TYPE=CTC,PART=LP1A,SWITCH=01
CHPID PATH=51,TYPE=CNC,PART=LP2A,SWITCH=01
CHPID PATH=52,TYPE=CTC,PART=LP3A,SWITCH=01
CHPID PATH=53,TYPE=CNC,PART=LP4A,SWITCH=01
CHPID PATH=54,TYPE=CNC,PART=LP1A,SWITCH=02
CHPID PATH=55,TYPE=CTC,PART=LP2A,SWITCH=02
CHPID PATH=56,TYPE=CNC,PART=LP3A,SWITCH=02
CHPID PATH=57,TYPE=CTC,PART=LP4A,SWITCH=02

**********************************
* First CTC ring with SWITCH 01  *
**********************************
*
**************************************************************
* CTC wrap-around connection between LP1A and LP2A
*
* Define a control unit representing destination channel CHPID 51 (CNC)
* to source channel CHPID 50 (CTC).
CNTLUNIT CUNUMBR=5020,PATH=50,LINK=C1,UNITADD=((40,6)),UNIT=SCTC
```

```
IODEVICE ADDRESS=(5020,6),CUNUMBR=5020,UNITADD=40,UNIT=SCTC
*
* Define a control unit representing destination channel CHPID 50 (CTC)
* to source channel CHPID 51 (CNC).
CNTLUNIT CUNUMBR=5110,PATH=51,LINK=C0,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5110,6),CUNUMBR=5110,UNITADD=40,UNIT=SCTC
*****************************************************************
* CTC wrap-around connection between LP2A and LP3A
*
* Define a control unit representing destination channel CHPID 52 (CTC)
* to source channel CHPID 51 (CNC).
CNTLUNIT CUNUMBR=5130,PATH=51,LINK=C2,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5130,6),CUNUMBR=5130,UNITADD=40,UNIT=SCTC
*
* Define a control unit representing destination channel CHPID 51 (CNC)
* to source channel CHPID 52 (CTC).
CNTLUNIT CUNUMBR=5220,PATH=52,LINK=C1,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5220,6),CUNUMBR=5220,UNITADD=40,UNIT=SCTC
*****************************************************************
* CTC wrap-around connection between LP3A and LP4A
*
* Define a control unit representing destination channel CHPID 53 (CNC)
* to source channel CHPID 52 (CTC).
CNTLUNIT CUNUMBR=5240,PATH=52,LINK=C3,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5240,6),CUNUMBR=5240,UNITADD=40,UNIT=SCTC
*
* Define a control unit representing destination channel CHPID 52 (CTC)
* to source channel CHPID 53 (CNC).
CNTLUNIT CUNUMBR=5330,PATH=53,LINK=C2,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5330,6),CUNUMBR=5330,UNITADD=40,UNIT=SCTC
*****************************************************************
* CTC wrap-around connection between LP4A and LP1A
*
* Define a control unit representing destination channel CHPID 50 (CTC)
* to source channel CHPID 53 (CNC).
CNTLUNIT CUNUMBR=5310,PATH=53,LINK=C0,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5310,6),CUNUMBR=5310,UNITADD=40,UNIT=SCTC
*
* Define a control unit representing destination channel CHPID 53 (CNC)
* to source channel CHPID 50 (CTC).
CNTLUNIT CUNUMBR=5040,PATH=50,LINK=C3,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5040,6),CUNUMBR=5040,UNITADD=40,UNIT=SCTC


**********************************
* Second CTC ring with SWITCH 02 *
**********************************
*
**************************************************************
* CTC wrap-around connection between LP1A and LP2A
*
* Define a control unit representing destination channel CHPID 55 (CTC)
* to source channel CHPID 54 (CNC).
CNTLUNIT CUNUMBR=5420,PATH=54,LINK=C6,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5420,6),CUNUMBR=5420,UNITADD=40,UNIT=SCTC
*
* Define a control unit representing destination channel CHPID 54 (CNC)
* to source channel CHPID 55 (CTC).
CNTLUNIT CUNUMBR=5510,PATH=55,LINK=C7,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5510,6),CUNUMBR=5510,UNITADD=40,UNIT=SCTC
*****************************************************************
* CTC wrap-around connection between LP2A and LP3A
*
* Define a control unit representing destination channel CHPID 56 (CNC)
* to source channel CHPID 55 (CTC).
CNTLUNIT CUNUMBR=5530,PATH=55,LINK=C5,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5530,6),CUNUMBR=5530,UNITADD=40,UNIT=SCTC
```

```
*
* Define a control unit representing destination channel CHPID 55 (CTC)
* to source channel CHPID 56 (CNC).
CNTLUNIT CUNUMBR=5620,PATH=56,LINK=C6,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5620,6),CUNUMBR=5620,UNITADD=40,UNIT=SCTC
*****************************************************************
* CTC wrap-around connection between LP3A and LP4A
*
* Define a control unit representing destination channel CHPID 57 (CTC)
* to source channel CHPID 56 (CNC).
CNTLUNIT CUNUMBR=5640,PATH=56,LINK=C4,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5640,6),CUNUMBR=5640,UNITADD=40,UNIT=SCTC
*
* Define a control unit representing destination channel CHPID 56 (CNC)
* to source channel CHPID 57 (CTC).
CNTLUNIT CUNUMBR=5730,PATH=57,LINK=C5,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5730,6),CUNUMBR=5730,UNITADD=40,UNIT=SCTC
*****************************************************************
* CTC wrap-around connection between LP4A and LP1A
*
* Define a control unit representing destination channel CHPID 54 (CNC)
* to source channel CHPID 57 (CTC).
CNTLUNIT CUNUMBR=5710,PATH=57,LINK=C7,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5710,6),CUNUMBR=5710,UNITADD=40,UNIT=SCTC
*
* Define a control unit representing destination channel CHPID 57 (CTC)
* to source channel CHPID 54 (CNC).
CNTLUNIT CUNUMBR=5410,PATH=54,LINK=C4,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5410,6),CUNUMBR=5410,UNITADD=40,UNIT=SCTC
```

MIF (shared) to non-MIF

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.

Four CTC communications are defined between each LP; except that, six CTC communications are defined for LP4A to any other LP. See Figure 32.

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.

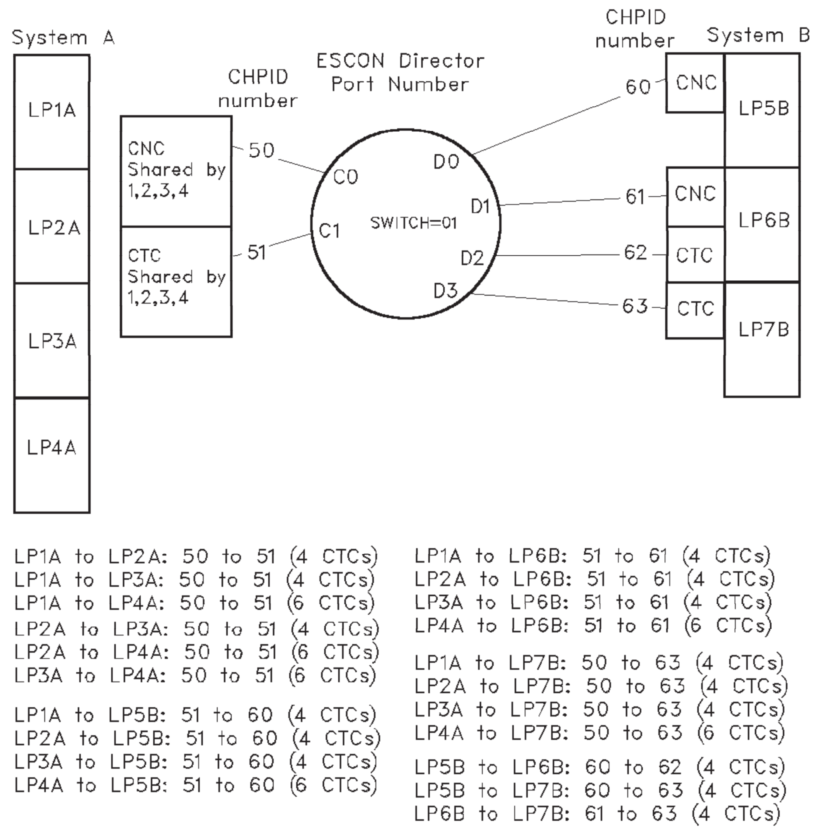

Figure 32. MIF (shared) to non-MIF

IOCP statements for system A (MIF 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 statements for system B (non-MIF)

```
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
```

MIF (shared) to non-MIF (fully redundant)

CNC CHPID 50 and CTC CHPID 51 in System A are shared by LP1A, LP2A, and LP3A. All participating partitions set up an any-to-any CTC configuration with full redundancy. Six CTC communications are defined between each partition. See Figure 33.

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.

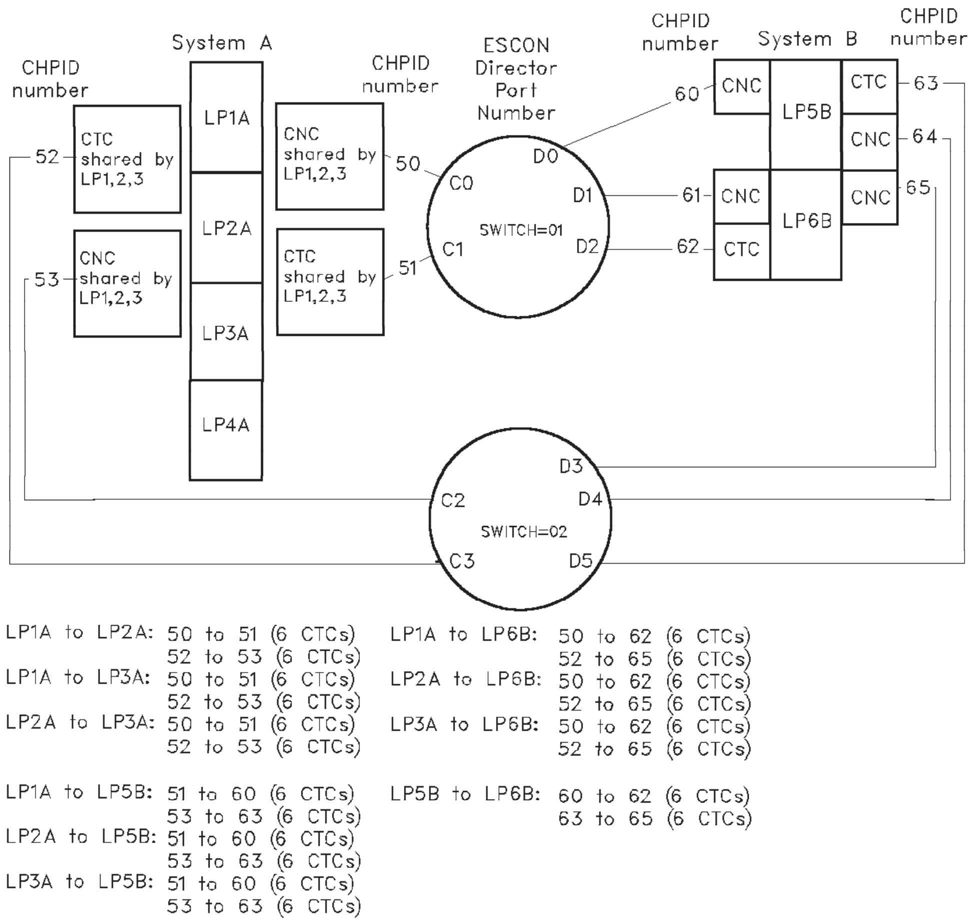

Figure 33. MIF (shared) to non-MIF (fully redundant)

IOCP statements for system A (MIF)

```
RESOURCE PARTITION=((LP1A,1),(LP2A,2),(LP3A,3),(LP4A,4))

CHPID PATH=50,TYPE=CNC,PART=(LP1A,LP2A,LP3A),SWITCH=01
CHPID PATH=51,TYPE=CTC,PART=(LP1A,LP2A,LP3A),SWITCH=01
CHPID PATH=52,TYPE=CTC,PART=(LP1A,LP2A,LP3A),SWITCH=02
CHPID PATH=53,TYPE=CNC,PART=(LP1A,LP2A,LP3A),SWITCH=02

****************************************************
* First any-to-any CTC connections with Switch=01 *
****************************************************
*
***********************************************************************
* CTC wrap-around connections among LP1A, LP2A, and LP3A
* 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=(5010,6),CUNUMBR=5010,UNITADD=40,PART=(LP2A,LP3A),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=(5020,6),CUNUMBR=5020,UNITADD=40,PART=(LP1A,LP3A),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=(5030,6),CUNUMBR=5030,UNITADD=40,PART=(LP1A,LP2A),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,PART=(LP2A,LP3A),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,PART=(LP1A,LP3A),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,PART=(LP1A,LP2A),UNIT=SCTC
*****************************************************************
* CTC connections between (LP1A,LP2A,LP3A) 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=(5150,6),CUNUMBR=5150,UNITADD=40,PART=(LP1A,LP2A,LP3A),
              UNIT=SCTC
*****************************************************************
* CTC connections between (LP1A,LP2A,LP3A) and LP6B
*
* Define a control unit representing destination channel CHPID 62 (CTC)
* to source channel CHPID 50 (CNC).
CNTLUNIT CUNUMBR=5060,PATH=50,LINK=D2,CUADD=0,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5060,6),CUNUMBR=5060,UNITADD=40,PART=(LP1A,LP2A,LP3A),
              UNIT=SCTC
****************************************************
* Second any-to-any CTC connections with Switch=02 *
****************************************************
*
*********************************************************************
* CTC wrap-around connections among LP1A, LP2A, and LP3A
* Via CHPID 52 (CTC) in System A to CHPID 53 (CNC) in System A
*
* Define a control unit representing each partition sharing
* destination channel CHPID 53 (CNC) to source channel CHPID 52 (CTC).

* Representing LP1A:
CNTLUNIT CUNUMBR=5210,PATH=52,LINK=C2,CUADD=1,UNITADD=((40,6)),UNIT=SCTC
* LP1A is excluded from PART keyword to disallow LP1A to LP1A CTC
IODEVICE ADDRESS=(5210,6),CUNUMBR=5210,UNITADD=40,PART=(LP2A,LP3A),UNIT=SCTC
*
* Representing LP2A:
CNTLUNIT CUNUMBR=5220,PATH=52,LINK=C2,CUADD=2,UNITADD=((40,6)),UNIT=SCTC
```

```
* LP2A is excluded from PART keyword to disallow LP2A to LP2A CTC
IODEVICE ADDRESS=(5220,6),CUNUMBR=5220,UNITADD=40,PART=(LP1A,LP3A),UNIT=SCTC
*
* Representing LP3A:
CNTLUNIT CUNUMBR=5230,PATH=52,LINK=C2,CUADD=3,UNITADD=((40,6)),UNIT=SCTC
* LP3A is excluded from PART keyword to disallow LP3A to LP3A CTC
IODEVICE ADDRESS=(5230,6),CUNUMBR=5230,UNITADD=40,PART=(LP1A,LP2A),UNIT=SCTC
*
*
* Define a control unit representing each partition sharing
* destination channel CHPID 52 (CTC) to source channel CHPID 53 (CNC).
* Representing LP1A:
CNTLUNIT CUNUMBR=5310,PATH=53,LINK=C3,CUADD=1,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5310,6),CUNUMBR=5310,UNITADD=40,PART=(LP2A,LP3A),UNIT=SCTC
*
* Representing LP2A:
CNTLUNIT CUNUMBR=5320,PATH=53,LINK=C3,CUADD=2,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5320,6),CUNUMBR=5320,UNITADD=40,PART=(LP1A,LP3A),UNIT=SCTC
*
* Representing LP3A:
CNTLUNIT CUNUMBR=5330,PATH=53,LINK=C3,CUADD=3,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5330,6),CUNUMBR=5330,UNITADD=40,PART=(LP1A,LP2A),UNIT=SCTC
*****************************************************************
* CTC connections between (LP1A,LP2A,LP3A) and LP5B
*
* Define a control unit representing destination channel CHPID 63 (CTC)
* to source channel CHPID 53 (CNC).
CNTLUNIT CUNUMBR=5350,PATH=53,LINK=D5,CUADD=0,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5350,6),CUNUMBR=5350,UNITADD=40,PART=(LP1A,LP2A,LP3A),UNIT=SCTC
*****************************************************************
* CTC connections between (LP1A,LP2A,LP3A) and LP6B
*
* Define a control unit representing destination channel CHPID 65 (CNC)
* to source channel CHPID 52 (CTC).
CNTLUNIT CUNUMBR=5260,PATH=52,LINK=D3,CUADD=0,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5260,6),CUNUMBR=5260,UNITADD=40,PART=(LP1A,LP2A,LP3A),UNIT=SCTC
```

IOCP statements for system B (non-MIF)

```
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=02
CHPID PATH=64,TYPE=CNC,SWITCH=02
CHPID PATH=65,TYPE=CNC,SWITCH=02

***************************************************
* First any-to-any CTC connections with Switch=01 *
***************************************************
*
**************************************************************
* CTC wrap-around connections among LP5B, and LP6B
*
* Define a control unit representing destination channel CHPID 62 (CTC)
* to source channel CHPID 60 (CNC).
CNTLUNIT CUNUMBR=6060,PATH=60,LINK=D2,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(6060,6),CUNUMBR=6060,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=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(6250,6),CUNUMBR=6250,UNITADD=40,UNIT=SCTC
*****************************************************************
* CTC connections between LP5B and (LP1A,LP2A,LP3A)
* 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=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(6010,6),CUNUMBR=6010,UNITADD=40,UNIT=SCTC
* Representing LP2A:
CNTLUNIT CUNUMBR=6020,PATH=60,LINK=C1,CUADD=2,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(6020,6),CUNUMBR=6020,UNITADD=40,UNIT=SCTC
* 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
*****************************************************************
* CTC connections between LP6B and (LP1A,LP2A,LP3A)
* Via CHPID 62 (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 62 (CTC).
*
* Representing LP1A:
CNTLUNIT CUNUMBR=6210,PATH=62,LINK=C0,CUADD=1,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(6210,6),CUNUMBR=6210,UNITADD=40,UNIT=SCTC
* Representing LP2A:
CNTLUNIT CUNUMBR=6220,PATH=62,LINK=C0,CUADD=2,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(6220,6),CUNUMBR=6220,UNITADD=40,UNIT=SCTC
* Representing LP3A:
CNTLUNIT CUNUMBR=6230,PATH=62,LINK=C0,CUADD=3,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(6230,6),CUNUMBR=6230,UNITADD=40,UNIT=SCTC
*
****************************************************
* Second any-to-any CTC connections with Switch=02 *
****************************************************
*
**************************************************************
* CTC wrap-around connections among LP5B, and LP6B
*
* Define a control unit representing destination channel CHPID 65 (CNC)
* to source channel CHPID 63 (CTC).
CNTLUNIT CUNUMBR=6360,PATH=63,LINK=D3,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(6360,6),CUNUMBR=6360,UNITADD=40,UNIT=SCTC
*
* Define a control unit representing destination channel CHPID 63 (CTC)
* to source channel CHPID 65 (CNC).
CNTLUNIT CUNUMBR=6550,PATH=65,LINK=D5,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(6550,6),CUNUMBR=6550,UNITADD=40,UNIT=SCTC
*****************************************************************
* CTC connections between LP5B and (LP1A,LP2A,LP3A)
* Via CHPID 63 (CTC) in System B to CHPID 53 (CNC) in System A
*
* Define a control unit representing each partition sharing
* destination channel CHPID 53 (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
* Representing LP3A:
CNTLUNIT CUNUMBR=6330,PATH=63,LINK=C2,CUADD=3,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(6330,6),CUNUMBR=6330,UNITADD=40,UNIT=SCTC
*****************************************************************
* CTC connections between LP6B and (LP1A,LP2A,LP3A)
* Via CHPID 65 (CNC) in System B to CHPID 52 (CTC) in System A
*
* Define a control unit representing each partition sharing
* destination channel CHPID 52 (CTC) to source channel CHPID 65 (CNC).
*
```

```
* Representing LP1A:
CNTLUNIT CUNUMBR=6510,PATH=65,LINK=C3,CUADD=1,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(6510,6),CUNUMBR=6510,UNITADD=40,UNIT=SCTC
* Representing LP2A:
CNTLUNIT CUNUMBR=6520,PATH=65,LINK=C3,CUADD=2,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(6520,6),CUNUMBR=6520,UNITADD=40,UNIT=SCTC
* Representing LP3A:
CNTLUNIT CUNUMBR=6530,PATH=65,LINK=C3,CUADD=3,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(6530,6),CUNUMBR=6530,UNITADD=40,UNIT=SCTC
```

MIF (shared) to MIF (shared) (workload not balanced)

CNC CHPID 50 and CTC CHPID 51 in System A are shared by LP1A, LP2A, LP3A, and LP4A. CNC CHPID 60 and CTC CHPID 61 in System B are respectively shared by LP5B, LP6B, and LP7B. All the partitions in the figure participate in an any-to-any CTC configuration with no redundancy. CTC communication workload between System A and System B is configured to go through one CTC connection (CHPID 51 to CHPID 60) only. The other potential CTC connection (CHPID 50 to CHPID 61) is not used.

Four CTC communications are defined between each partition; except that, six CTC communications are defined for LP4A to any other partition. See Figure 34.

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.

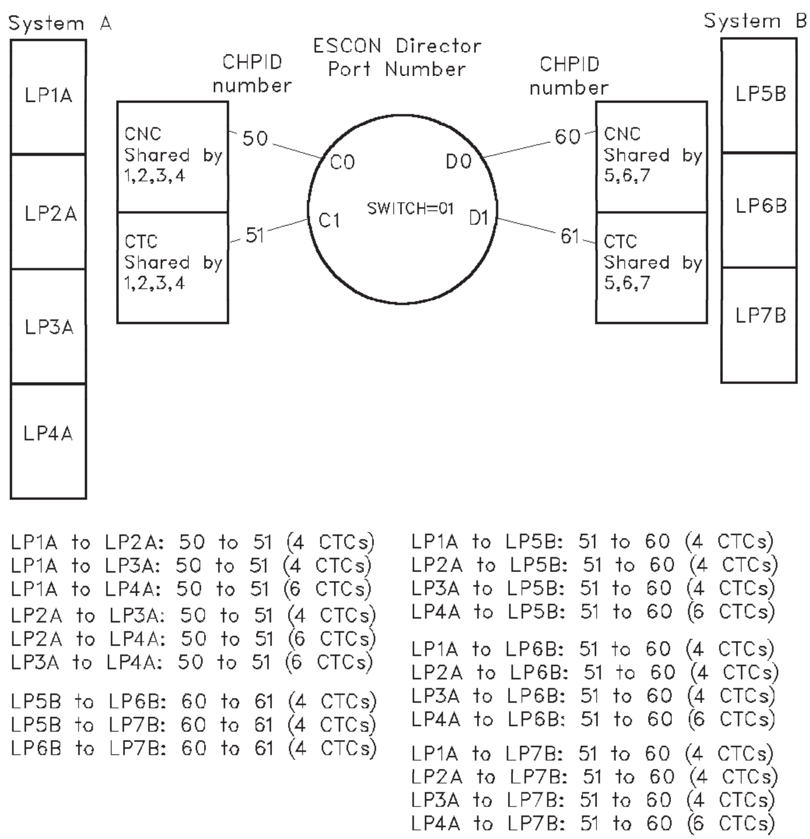

Figure 34. MIF (shared) to MIF (shared) (workload not balanced)

IOCP statements for system A (MIF 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,PART=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,PART=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
* LP1A is excluded from PART keyword to disallow LP1A to LP1A CTC
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
* LP2A is excluded from PART keyword to disallow LP2A to LP2A CTC
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
* LP3A is excluded from PART keyword to disallow LP3A to LP3A CTC
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
* LP4A is excluded from PART keyword to disallow LP4A to LP4A CTC
IODEVICE ADDRESS=(5140,6),CUNUMBR=5140,UNITADD=40,PART=(LP1A,LP2A,LP3A),UNIT=SCTC
**********************************************************************
* CTC connections between (LP1A,LP2A,LP3A,LP4A) and (LP5B,LP6B,LP7B)
* Via CHPID 51 (CTC) in System A to CHPID 60 (CNC) in System B
*
* Define a control unit representing each partition sharing
* destination channel CHPID 60 (CNC) to source channel CHPID 51 (CTC)
* Representing LP5B:
CNTLUNIT CUNUMBR=5150,PATH=51,LINK=D0,CUADD=5,UNITADD=((40,4)),UNIT=SCTC
IODEVICE ADDRESS=(5150,4),CUNUMBR=5150,UNITADD=40,UNIT=SCTC
IODEVICE ADDRESS=(5154,2),CUNUMBR=5150,UNITADD=44,PART=LP4A,UNIT=SCTC
*
* Representing LP6B:
CNTLUNIT CUNUMBR=5160,PATH=51,LINK=D0,CUADD=6,UNITADD=((40,4)),UNIT=SCTC
IODEVICE ADDRESS=(5160,4),CUNUMBR=5160,UNITADD=40,UNIT=SCTC
IODEVICE ADDRESS=(5164,2),CUNUMBR=5160,UNITADD=44,PART=LP4A,UNIT=SCTC
*
* Representing LP7B:
```

```
CNTLUNIT CUNUMBR=5170,PATH=51,LINK=D0,CUADD=7,UNITADD=((40,)),UNIT=SCTC
IODEVICE ADDRESS=(5170,4),CUNUMBR=5170,UNITADD=40,UNIT=SCTC
IODEVICE ADDRESS=(5174,2),CUNUMBR=5170,UNITADD=44,PART=LP4A,UNIT=SCTC
```

IOCP statements for system B (MIF shared)

```
RESOURCE PARTITION=((LP5B,5),(LP6B,6),(LP7B,7))

CHPID PATH=60,TYPE=CNC,SWITCH=01,SHARED
CHPID PATH=61,TYPE=CTC,SWITCH=01,SHARED

**************************************************************
* 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=((40,4)),UNIT=SCTC
* LP5B is excluded from PART keyword to disallow LP5B to LP5B CTC
IODEVICE ADDRESS=(6050,4),CUNUMBR=6050,UNITADD=40,PART=(LP6B,LP7B),UNIT=SCTC
*
* Representing LP6B:
CNTLUNIT CUNUMBR=6060,PATH=60,LINK=D1,CUADD=6,UNITADD=((40,4)),UNIT=SCTC
* LP6B is excluded from PART keyword to disallow LP6B to LP6B CTC
IODEVICE ADDRESS=(6060,4),CUNUMBR=6060,UNITADD=40,PART=(LP5B,LP7B),UNIT=SCTC
*
* Representing LP7B:
CNTLUNIT CUNUMBR=6070,PATH=60,LINK=D1,CUADD=7,UNITADD=((40,4)),UNIT=SCTC
* LP7B is excluded from PART keyword to disallow LP7B to LP7B CTC
IODEVICE ADDRESS=(6070,4),CUNUMBR=6070,UNITADD=40,PART=(LP5B,LP6B),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=((40,4)),UNIT=SCTC
* LP5B is excluded from PART keyword to disallow LP5B to LP5B CTC
IODEVICE ADDRESS=(6150,4),CUNUMBR=6150,UNITADD=40,PART=(LP6B,LP7B),UNIT=SCTC
*
* Representing LP6B:
CNTLUNIT CUNUMBR=6160,PATH=61,LINK=D0,CUADD=6,UNITADD=((40,4)),UNIT=SCTC
* LP6B is excluded from PART keyword to disallow LP6B to LP6B CTC
IODEVICE ADDRESS=(6160,4),CUNUMBR=6160,UNITADD=40,PART=(LP5B,LP7B),UNIT=SCTC
*
* Representing LP7B:
CNTLUNIT CUNUMBR=6170,PATH=61,LINK=D0,CUADD=7,UNITADD=((40,4)),UNIT=SCTC
* LP7B is excluded from PART keyword to disallow LP7B to LP7B CTC
IODEVICE ADDRESS=(6170,4),CUNUMBR=6170,UNITADD=40,PART=(LP5B,LP6B),UNIT=SCTC
**********************************************************************
* CTC connections between (LP5B,LP6B,LP7B) 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
```

MIF (shared) to MIF (shared) workload balanced

CNC CHPID 50 and CTC CHPID 51 in System A are shared by LP1A, LP2A, LP3A, and LP4A. CNC CHPID 60 and CTC CHPID 61 in System B are shared respectively by LP5B, LP6B and LP7B. All the partitions in the figure participate in an any-to-any CTC configuration with no redundancy. CTC communication workload between System A and System B is divided between two CTC connections: CHPID 51 to CHPID 60, and CHPID 50 to CHPID 61.

Four CTC communications are defined between each partition; except that, six CTC communications are defined for LP4A to any other partition. See Figure 35.

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.

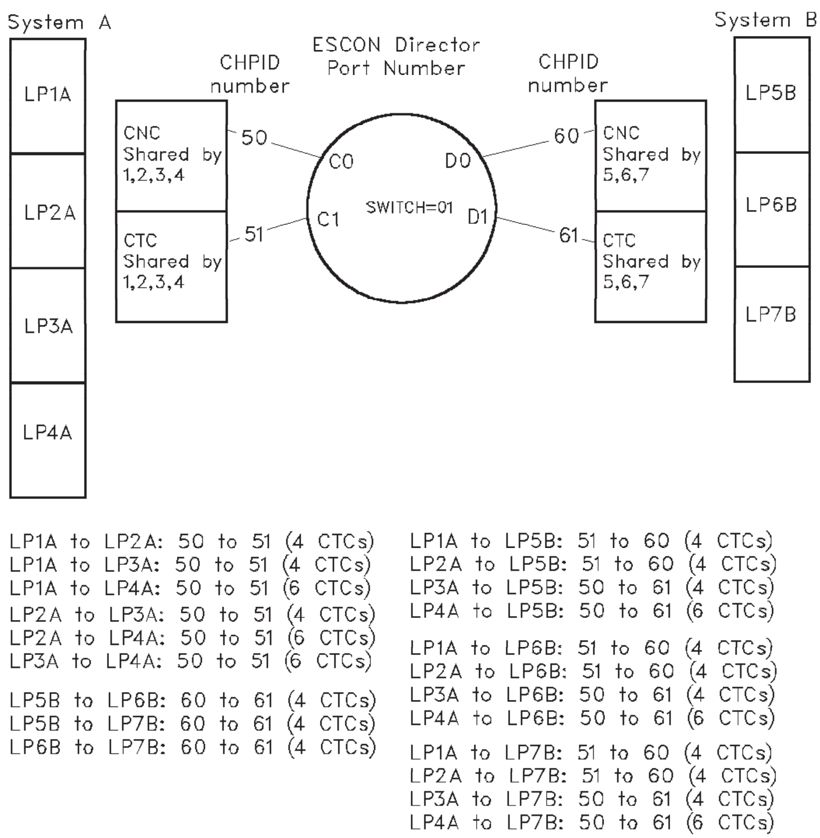

Figure 35. MIF (shared) to MIF (shared) (workload balanced)

IOCP statements For system A (MIF 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,PART=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,PART=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
* LP1A is excluded from PART keyword to disallow LP1A to LP1A CTC
IODEVICE ADDRESS=(5110,4),CUNUMBR=5110,UNITADD=40,PART=(LP2A,LP3A,LP4A),UNIT=SCTC
IODEVICE ADDRESS=(5114,2),CUNUMBR=5110,UNITADD=44,PART=LP4A,UNIT=SCTC
*
* Representing LP2A:
CNTLUNIT CUNUMBR=5120,PATH=51,LINK=C0,CUADD=2,UNITADD=((40,6)),UNIT=SCTC
* LP2A is excluded from PART keyword to disallow LP2A to LP2A CTC
IODEVICE ADDRESS=(5120,4),CUNUMBR=5120,UNITADD=40,PART=(LP1A,LP3A,LP4A),UNIT=SCTC
IODEVICE ADDRESS=(5124,2),CUNUMBR=5120,UNITADD=44,PART=LP4A,UNIT=SCTC
*
* Representing LP3A:
CNTLUNIT CUNUMBR=5130,PATH=51,LINK=C0,CUADD=3,UNITADD=((40,6)),UNIT=SCTC
* LP3A is excluded from PART keyword to disallow LP3A to LP3A CTC
IODEVICE ADDRESS=(5130,4),CUNUMBR=5130,UNITADD=40,PART=(LP1A,LP2A,LP4A),UNIT=SCTC
IODEVICE ADDRESS=(5134,2),CUNUMBR=5130,UNITADD=44,PART=LP4A,UNIT=SCTC
*
* Representing LP4A:
CNTLUNIT CUNUMBR=5140,PATH=51,LINK=C0,CUADD=4,UNITADD=((40,6)),UNIT=SCTC
* LP4A is excluded from PART keyword to disallow LP4A to LP4A CTC
IODEVICE ADDRESS=(5140,6),CUNUMBR=5140,UNITADD=40,PART=(LP1A,LP2A,LP3A),UNIT=SCTC
**********************************************************************
* CTC connections between (LP1A,LP2A) and (LP5B,LP6B,LP7B)
* Via CHPID 51 (CTC) in System A to CHPID 60 (CNC) in System B
*
* Define a control unit representing each partition sharing
* destination channel CHPID 60 (CNC) to source channel CHPID 51 (CTC)
* Representing LP5B:
CNTLUNIT CUNUMBR=5150,PATH=51,LINK=D0,CUADD=5,UNITADD=((40,4)),UNIT=SCTC
IODEVICE ADDRESS=(5150,4),CUNUMBR=5150,UNITADD=40,PART=(LP1A,LP2A),UNIT=SCTC
*
* Representing LP6B:
CNTLUNIT CUNUMBR=5160,PATH=51,LINK=D0,CUADD=6,UNITADD=((40,4)),UNIT=SCTC
IODEVICE ADDRESS=(5160,4),CUNUMBR=5160,UNITADD=40,PART=(LP1A,LP2A),UNIT=SCTC
*
* Representing LP7B:
CNTLUNIT CUNUMBR=5170,PATH=51,LINK=D0,CUADD=7,UNITADD=((40,4)),UNIT=SCTC
IODEVICE ADDRESS=(5170,4),CUNUMBR=5170,UNITADD=40,PART=(LP1A,LP2A),UNIT=SCTC
***********************************************************************
* CTC connections between (LP3A,LP4A) and (LP5B,LP6B,LP7B)
```

```
* Via CHPID 50 (CNC) in System A to CHPID 61 (CTC) in System B
*
* Define a control unit representing each partition sharing
* destination channel CHPID 61 (CTC) to source channel CHPID 50 (CNC)
* Representing LP5B:
CNTLUNIT CUNUMBR=5050,PATH=50,LINK=D1,CUADD=5,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5050,4),CUNUMBR=5050,UNITADD=40,PART=(LP3A,LP4A),UNIT=SCTC
IODEVICE ADDRESS=(5054,2),CUNUMBR=5050,UNITADD=44,PART=LP4A,UNIT=SCTC
*
* Representing LP6B:
CNTLUNIT CUNUMBR=5060,PATH=50,LINK=D1,CUADD=6,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5060,4),CUNUMBR=5060,UNITADD=40,PART=(LP3A,LP4A),UNIT=SCTC
IODEVICE ADDRESS=(5064,2),CUNUMBR=5060,UNITADD=44,PART=LP4A,UNIT=SCTC
*
* Representing LP7B:
CNTLUNIT CUNUMBR=5070,PATH=50,LINK=D1,CUADD=7,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(5070,4),CUNUMBR=5070,UNITADD=40,PART=(LP3A,LP4A),UNIT=SCTC
IODEVICE ADDRESS=(5074,2),CUNUMBR=5070,UNITADD=44,PART=LP4A,UNIT=SCTC
```

IOCP statements for system B (MIF shared)

```
RESOURCE PARTITION=((LP5B,5),(LP6B,6),(LP7B,7))

CHPID PATH=60,TYPE=CNC,SWITCH=01,SHARED
CHPID PATH=61,TYPE=CTC,SWITCH=01,SHARED

**************************************************************
* 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=((40,4)),UNIT=SCTC
* LP5B is excluded from PART keyword to disallow LP5B to LP5B CTC
IODEVICE ADDRESS=(6050,4),CUNUMBR=6050,UNITADD=40,PART=(LP6B,LP7B),UNIT=SCTC
*
* Representing LP6B:
CNTLUNIT CUNUMBR=6060,PATH=60,LINK=D1,CUADD=6,UNITADD=((40,4)),UNIT=SCTC
* LP6B is excluded from PART keyword to disallow LP6B to LP6B CTC
IODEVICE ADDRESS=(6060,4),CUNUMBR=6060,UNITADD=40,PART=(LP5B,LP7B),UNIT=SCTC
*
* Representing LP7B:
CNTLUNIT CUNUMBR=6070,PATH=60,LINK=D1,CUADD=7,UNITADD=((40,4)),UNIT=SCTC
* LP7B is excluded from PART keyword to disallow LP7B to LP7B CTC
IODEVICE ADDRESS=(6070,4),CUNUMBR=6070,UNITADD=40,PART=(LP5B,LP6B),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=((40,4)),UNIT=SCTC
* LP5B is excluded from PART keyword to disallow LP5B to LP5B CTC
IODEVICE ADDRESS=(6150,4),CUNUMBR=6150,UNITADD=40,PART=(LP6B,LP7B),UNIT=SCTC
*
* Representing LP6B:
CNTLUNIT CUNUMBR=6160,PATH=61,LINK=D0,CUADD=6,UNITADD=((40,4)),UNIT=SCTC
* LP6B is excluded from PART keyword to disallow LP6B to LP6B CTC
IODEVICE ADDRESS=(6160,4),CUNUMBR=6160,UNITADD=40,PART=(LP5B,LP7B),UNIT=SCTC
*
* Representing LP7B:
CNTLUNIT CUNUMBR=6170,PATH=61,LINK=D0,CUADD=7,UNITADD=((40,4)),UNIT=SCTC
* LP7B is excluded from PART keyword to disallow LP7B to LP7B CTC
IODEVICE ADDRESS=(6170,4),CUNUMBR=6170,UNITADD=40,PART=(LP5B,LP6B),UNIT=SCTC
**********************************************************************
* CTC connections between (LP5B,LP6B,LP7B) and (LP1A,LP2A)
* 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
**********************************************************************
* CTC connections between (LP5B,LP6B,LP7B) and (LP3A,LP4A)
* 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 LP3A:
CNTLUNIT CUNUMBR=6130,PATH=61,LINK=C0,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=C0,CUADD=4,UNITADD=((40,6)),UNIT=SCTC
IODEVICE ADDRESS=(6140,6),CUNUMBR=6140,UNITADD=40,UNIT=SCTC
```

MIF (shared) to MIF (shared) (fully redundant and workload balanced)

Two sets of a CTC minimum configuration, each CTC configuration associated with a separate ESCON Director, make up a fully redundant any-to-any CTC configuration. CTC communication workload between System A and System B is balanced between 4 CTC connections. See Figure 36.

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.

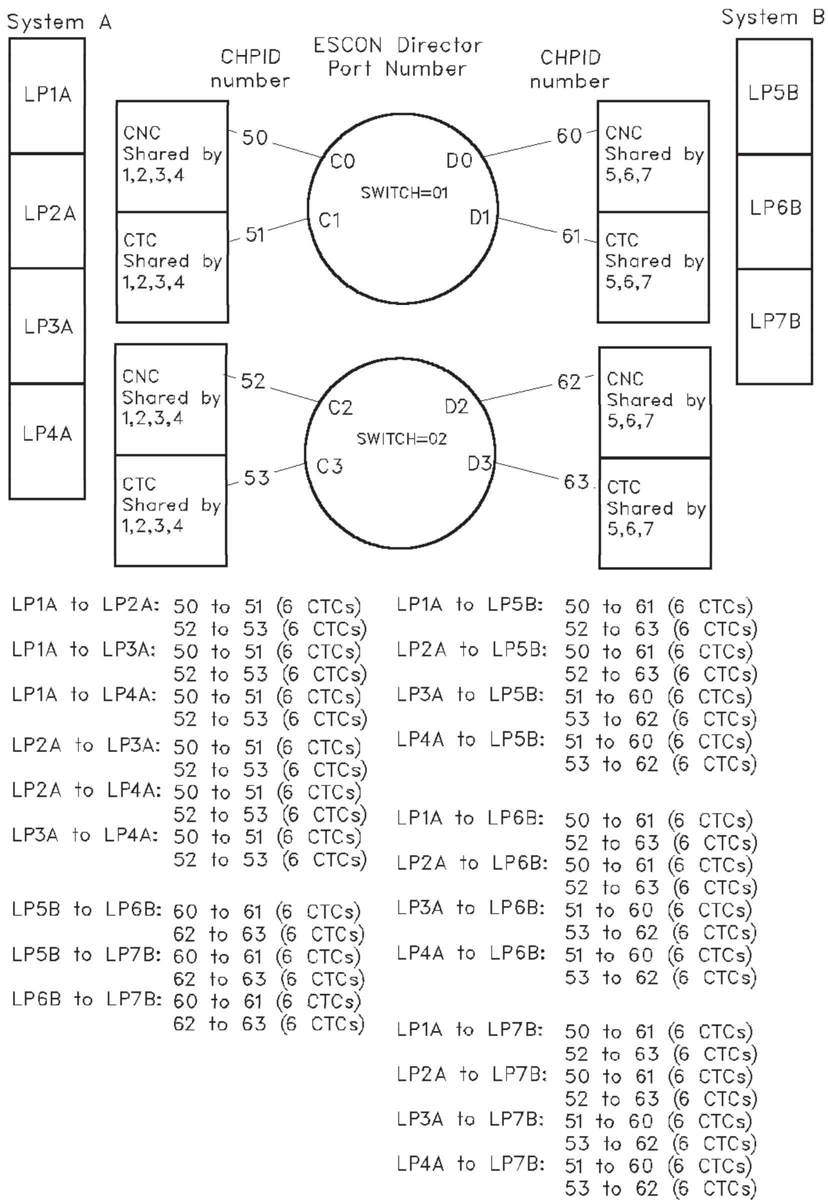

Figure 36. MIF (shared) to MIF (shared) (fully redundant)

IOCP Statements for System A (MIF 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 statements for system B (MIF shared)

```
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
```

Appendix B. FICON configuration examples

This appendix contains several examples to illustrate various FICON CTC configurations. IOCP statements included with each figure show the correct way to code the configuration.

FICON CTC and Director with single path

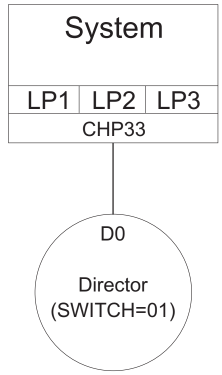

Figure 37. FICON CTC and director with single path

Note: The following IOCP statements cannot follow the complete control unit and device numbering recommendations in Chapter 5, "Recommendations for Numbering CTC Control Units and Devices". It does use a CTC image ID for the second and third digits of the control unit and device numbers. But the first digit cannot use even numbers for just send devices and odd numbers for just receiving devices. Also, each system control program (SCP) must have a customized device definition.

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
*
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, device 100 in LPAR1, device 200 in LPAR2, and device 300 in LPAR3 can all communicate with each other. This example defines separate send and receive devices to be used by application programs 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.

FICON CTC fully redundant and half duplex

Two sets of a CTC minimum configuration, each CTC configuration associated with a separate FICON Director, make up a fully redundant any-to-any CTC configuration. CTC communication is configured such that the definitions operate in half duplex on the FICON channels. See Figure 38 on page 103.

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.

Note: The following IOCP statements follow the control unit and device numbering recommendations in Chapter 5, "Recommendations for Numbering CTC Control Units and Devices". Logical partitions LP1A through LP4A have been assigned CTC image IDs of 01 through 04 and logical partitions LP1B through LP3B have been assigned CTC image IDs of 21 through 23.

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, FCTC control unit 4010 is always used by all CPCs 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 will be on one fibre of the FICON channel resulting in it 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.

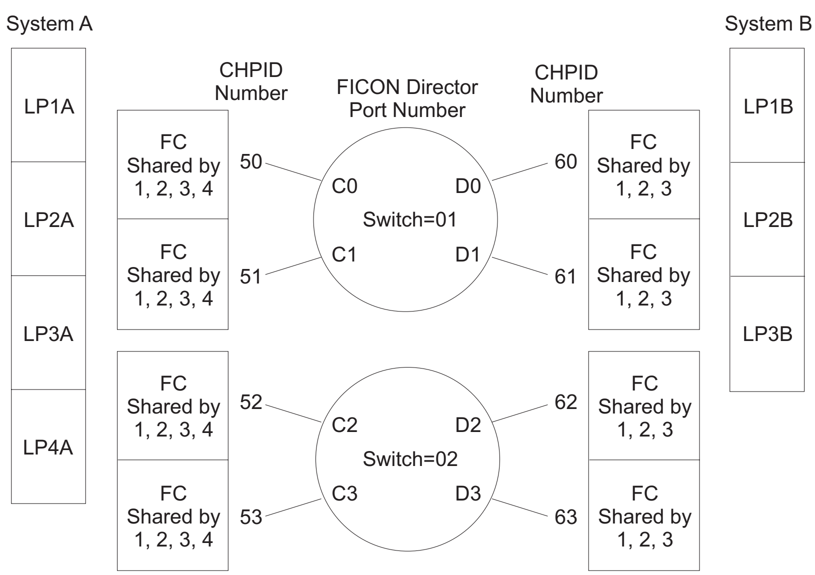

Figure 38. FICON CTC (fully redundant)

Every logical partition has 8 primary and 8 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 Control Unit 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 Control Unit 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 Control Unit 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 Control Unit 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 Control Unit 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 Control Unit 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 Control Unit 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 Control Unit 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 Control Unit 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 Control Unit 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 Control Unit 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 Control Unit 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 Control Unit 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 Control Unit 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 ADD            RESS=(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 Control Unit 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 Control Unit 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 Control Unit 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 Control Unit 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 Control Unit 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 Control Unit 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 Control Unit 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 Control Unit 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 Control Unit 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 Control Unit 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 Control Unit 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 Control Unit 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 Control Unit 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 Control Unit 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 +
```

FICON CTC fully redundant and full duplex

Two sets of a CTC minimum configuration, each CTC configuration associated with a separate FICON Director, make up a fully redundant any-to-any CTC configuration. CTC communication is configured so that it takes advantage of the full duplex capability of FICON channels. See Figure 39 on page 112.

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.

Note: The following IOCP statements follow the control unit and device numbering recommendations in Chapter 5, "Recommendations for Numbering CTC Control Units and Devices". Logical partitions LP1A through LP4A have been assigned CTC image IDs of 01 through 04 and logical partitions LP1B through LP3B have been assigned CTC image IDs of 21 through 23.

This example balances FICON CTC workload on the FICON channels by alternating the destination link addresses associated with a control unit number. When connecting the first two FICON channels to communicate with each other, each channel has only receive FCTC control units or send FCTC control units. For example, control units 4010 through 4040 are all send FCTC control units on CHPID 50 on System A and connect to link address C1 (CHPID 51) on System A. CHPID 50 is only used for sending I/O data to System A.

When connecting another pair of channels to the first two, alternate the role that they play by selecting different destination link addresses. For example, control units 4010 through 4040 are all send FCTC control units on CHPID 61 on System B but connect to link address C0 (CHPID 50) on System A instead of link address C1. CHPID 50 is only used for receiving I/O data from System B. Therefore, the configuration has balanced the workload on CHPID 50 by configuring the CTC communications to take advantage of the full duplex capability of the FICON channel. When connecting more CPCs and channels, continue to alternate destination link addresses so that the CTC communications on channels are kept balanced between receiving and sending and are full duplex.

A simpler configuration approach that can be used is to always use the same destination link address for a control unit number as illustrated in the preceding section, "FICON CTC fully redundant and half duplex" on page 103. The simpler approach results in the FICON channels having half duplex definitions.

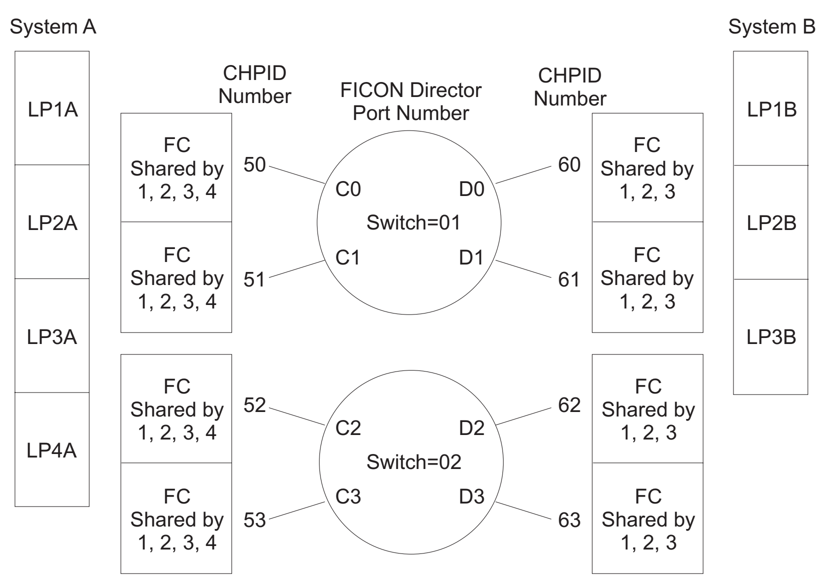

Figure 39. FICON CTC (fully redundant)

Every logical partition has 8 primary and 8 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 Control Unit 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 Control Unit 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 Control Unit 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 Control Unit 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. *
* To balance workload and have FICON channels be full duplex on *
* System A, send control units (CUs) use 51 and receive CUs use 50. *
* To balance workload and have FICON channels be full duplex on *
* System B, send CUs use destination CHPID 60 and receive CUs use 61.*
**********************************************************************
*
* Send FCTC Control Unit and Device Definitions to CTC image ID 21
*
CNTLUNIT CUNUMBR=4210,PATH=51,LINK=D0,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=51,LINK=D0,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=51,LINK=D0,CUADD=3,UNITADD=((00,8)), +
            UNIT=FCTC
IODEVICE ADDRESS=(4230,8),CUNUMBR=4230,UNIT=FCTC,UNITADD=00 +
*
* Receive FCTC Control Unit and Device Definitions from CTC image ID 21
*
CNTLUNIT CUNUMBR=5210,PATH=50,LINK=D1,CUADD=1,UNITADD=((00,8)), +
            UNIT=FCTC
IODEVICE ADDRESS=(5210,8),CUNUMBR=5210,UNIT=FCTC,UNITADD=00 +
*
* Receive FCTC Control Unit and Device Definitions from CTC image ID 22
*
CNTLUNIT CUNUMBR=5220,PATH=50,LINK=D1,CUADD=2,UNITADD=((00,8)), +
            UNIT=FCTC
IODEVICE ADDRESS=(5220,8),CUNUMBR=5220,UNIT=FCTC,UNITADD=00 +
*
* Receive FCTC Control Unit and Device Definitions from CTC image ID 23
*
CNTLUNIT CUNUMBR=5230,PATH=50,LINK=D1,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 Control Unit 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 Control Unit 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 Control Unit 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 Control Unit 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. *
* To balance workload and have FICON channels be full duplex on *
* System A, send control units (CUs) use 53 and receive CUs use 52. *
* To balance workload and have FICON channels be full duplex on *
* System B, send CUs use destination CHPID 62 and receive CUs use 63. *
*********************************************************************
*
* Send FCTC Control Unit and Device Definitions to CTC image ID 21
*
CNTLUNIT CUNUMBR=4218,PATH=53,LINK=D2,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=53,LINK=D2,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=53,LINK=D2,CUADD=3,UNITADD=((00,8)), +
UNIT=FCTC
IODEVICE ADDRESS=(4238,8),CUNUMBR=4238,UNIT=FCTC,UNITADD=00 +
*
* Receive FCTC Control Unit and Device Definitions from CTC image ID 21
*
CNTLUNIT CUNUMBR=5218,PATH=52,LINK=D3,CUADD=1,UNITADD=((00,8)), +
UNIT=FCTC
IODEVICE ADDRESS=(5218,8),CUNUMBR=5218,UNIT=FCTC,UNITADD=00 +
*
* Receive FCTC Control Unit and Device Definitions from CTC image ID 22
*
CNTLUNIT CUNUMBR=5228,PATH=52,LINK=D3,CUADD=2,UNITADD=((00,8)), +
UNIT=FCTC
IODEVICE ADDRESS=(5228,8),CUNUMBR=5228,UNIT=FCTC,UNITADD=00 +
*
* Receive FCTC Control Unit and Device Definitions from CTC image ID 23
*
CNTLUNIT CUNUMBR=5238,PATH=52,LINK=D3,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 Control Unit 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 Control Unit 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 Control Unit 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. *
* To balance workload and have FICON channels be full duplex on *
* System B, send control units (CUs) use 61 and receive CUs use 60. *
* To balance workload and have FICON channels be full duplex on *
* System A, send CUs use destination CHPID 50 and receive CUs use 51.*
**********************************************************************
*
* Send FCTC Control Unit and Device Definitions to CTC image ID 01
```

```
*
CNTLUNIT CUNUMBR=4010,PATH=61,LINK=C0,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=61,LINK=C0,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=61,LINK=C0,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=61,LINK=C0,CUADD=4,UNITADD=((00,8)), +
            UNIT=FCTC
IODEVICE ADDRESS=(4040,8),CUNUMBR=4040,UNIT=FCTC,UNITADD=00 +
*
* Receive FCTC Control Unit and Device Definitions from CTC image ID 01
*
CNTLUNIT CUNUMBR=5010,PATH=60,LINK=C1,CUADD=1,UNITADD=((00,8)), +
            UNIT=FCTC
IODEVICE ADDRESS=(5010,8),CUNUMBR=5010,UNIT=FCTC,UNITADD=00 +
*
* Receive FCTC Control Unit and Device Definitions from CTC image ID 02
*
CNTLUNIT CUNUMBR=5020,PATH=60,LINK=C1,CUADD=2,UNITADD=((00,8)), +
            UNIT=FCTC
IODEVICE ADDRESS=(5020,8),CUNUMBR=5020,UNIT=FCTC,UNITADD=00 +
*
* Receive FCTC Control Unit and Device Definitions from CTC image ID 03
*
CNTLUNIT CUNUMBR=5030,PATH=60,LINK=C1,CUADD=3,UNITADD=((00,8)), +
            UNIT=FCTC
IODEVICE ADDRESS=(5030,8),CUNUMBR=5030,UNIT=FCTC,UNITADD=00 +
*
* Receive FCTC Control Unit and Device Definitions from CTC image ID 04
*
CNTLUNIT CUNUMBR=5040,PATH=60,LINK=C1,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 Control Unit 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 Control Unit 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 Control Unit 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. *
* To balance workload and have FICON channels be full duplex on *
* System B, send control units (CUs) use 63 and receive CUs use 62. *
* To balance workload and have FICON channels be full duplex on *
* System A, send CUs use destination CHPID 52 and receive CUs use 53. *
***********************************************************************
*
* Send FCTC Control Unit and Device Definitions to CTC image ID 01
*
CNTLUNIT CUNUMBR=4018,PATH=63,LINK=C2,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=63,LINK=C2,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=63,LINK=C2,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=63,LINK=C2,CUADD=4,UNITADD=((00,8)), +
            UNIT=FCTC
IODEVICE ADDRESS=(4048,8),CUNUMBR=4048,UNIT=FCTC,UNITADD=00 +
*
* Receive FCTC Control Unit and Device Definitions from CTC image ID 01
*
CNTLUNIT CUNUMBR=5018,PATH=62,LINK=C3,CUADD=1,UNITADD=((00,8)), +
            UNIT=FCTC
IODEVICE ADDRESS=(5018,8),CUNUMBR=5018,UNIT=FCTC,UNITADD=00 +
*
```

```
* Receive FCTC Control Unit and Device Definitions from CTC image ID 02
*
CNTLUNIT CUNUMBR=5028,PATH=62,LINK=C3,CUADD=2,UNITADD=((00,8)), +
            UNIT=FCTC
IODEVICE ADDRESS=(5028,8),CUNUMBR=5028,UNIT=FCTC,UNITADD=00 +
*
* Receive FCTC Control Unit and Device Definitions from CTC image ID 03
*
CNTLUNIT CUNUMBR=5038,PATH=62,LINK=C3,CUADD=3,UNITADD=((00,8)), +
            UNIT=FCTC
IODEVICE ADDRESS=(5038,8),CUNUMBR=5038,UNIT=FCTC,UNITADD=00 +
*
* Receive FCTC Control Unit and Device Definitions from CTC image ID 04
*
CNTLUNIT CUNUMBR=5048,PATH=62,LINK=C3,CUADD=4,UNITADD=((00,8)), +
            UNIT=FCTC
IODEVICE ADDRESS=(5048,8),CUNUMBR=5048,UNIT=FCTC,UNITADD=00 +
```

FICON CTC with multiple logical channel subsystems

System z9 and zSeries processors other than z800 and z900 support multiple logical channel subsystems (CSSs). When communicating to a shared FC channel path on a System z9 or zSeries processor other than a z/800 or z/900, the logical address (CUADD keyword on CNTLUNIT statement) specified must be two digits if the destination logical partition has a non-zero CSS ID. This example illustrates when two-digit CUADD values are required and when they are not. The CTC connections for switch 02 illustrate that no CUADD value is used when communicating with an unshared channel path.

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.

Note: The following IOCP statements follow the control unit and device numbering recommendations in Chapter 5, "Recommendations for Numbering CTC Control Units and Devices". Logical partitions LP01A through LP14A have been assigned CTC image IDs of 01 through 04 and logical partitions LP1B through LP3B have been assigned CTC image IDs of 21 through 23.

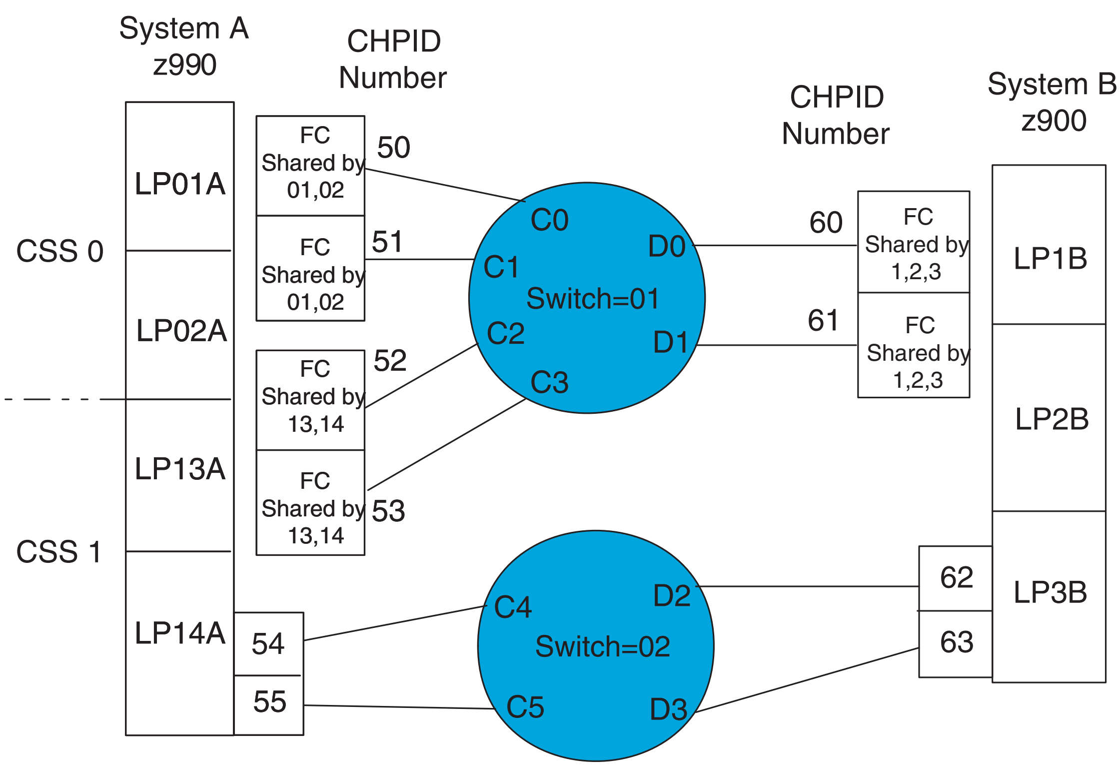

Figure 40. FICON CTC with multiple logical channel subsystems

IOCP statements for system A

```
  RESOURCE PART=((CSS(0),(LP01A,1),(LP02A,2)),                          +
               (CSS(1),(LP13A,3),(LP14A,4)))
*
```

```
 CHPID PATH=(CSS(0),50),PCHID=100,TYPE=FC,SWITCH=01,SHARED
 CHPID PATH=(CSS(0),51),PCHID=101,TYPE=FC,SWITCH=01,SHARED
 CHPID PATH=(CSS(1),52),PCHID=110,TYPE=FC,SWITCH=01,SHARED
 CHPID PATH=(CSS(1),53),PCHID=111,TYPE=FC,SWITCH=01,SHARED
 CHPID PATH=(CSS(1),54),PCHID=120,TYPE=FC,SWITCH=02,PART=LP14A
 CHPID PATH=(CSS(1),55),PCHID=121,TYPE=FC,SWITCH=02,PART=LP14A
*
**********************************
* CTC connections with SWITCH=01 *
**********************************
*
***************************************************************
* Wrap-around connections for logical partitions on System A *
***************************************************************
*
* Send FCTC Control Unit and Device Definitions to CTC image ID 01
* (CUADD value can be 01 or 1)
*
 CNTLUNIT CUNUMBR=4010,PATH=((CSS(0),50),(CSS(1),52)),                +
              LINK=((CSS(0),C1),(CSS(1),C1)),CUADD=1,                 +
              UNITADD=((00,8)),UNIT=FCTC
 IODEVICE ADDRESS=(4010,8),CUNUMBR=4010,UNIT=FCTC,UNITADD=00,         +
              NOTPART=(CSS(0),LP01A)
*
* Send FCTC Control Unit and Device Definitions to CTC image ID 02
* (CUADD value can be 02 or 2)
*
 CNTLUNIT CUNUMBR=4020,PATH=((CSS(0),50),(CSS(1),52)),                +
              LINK=((CSS(0),C1),(CSS(1),C1)),CUADD=02,                +
              UNITADD=((00,8)),UNIT=FCTC
 IODEVICE ADDRESS=(4020,8),CUNUMBR=4020,UNIT=FCTC,UNITADD=00,         +
              NOTPART=(CSS(0),LP02A)
*
* Send FCTC Control Unit and Device Definitions to CTC image ID 03
* (CUADD value must be 13 for CSS ID 1 and MIF image ID 3)
*
 CNTLUNIT CUNUMBR=4030,PATH=((CSS(0),50),(CSS(1),52)),                +
              LINK=((CSS(0),C3),(CSS(1),C3)),CUADD=13,                +
              UNITADD=((00,8)),UNIT=FCTC
 IODEVICE ADDRESS=(4030,8),CUNUMBR=4030,UNIT=FCTC,UNITADD=00,         +
              NOTPART=(CSS(1),LP13A)
*
* Send FCTC Control Unit and Device Definitions to CTC image ID 04
* (CUADD value must be 14 for CSS ID 1 and MIF image ID 4)
*
 CNTLUNIT CUNUMBR=4040,PATH=((CSS(0),50),(CSS(1),52)),                +
              LINK=((CSS(0),C3),(CSS(1),C3)),CUADD=14,                +
              UNITADD=((00,8)),UNIT=FCTC
 IODEVICE ADDRESS=(4040,8),CUNUMBR=4040,UNIT=FCTC,UNITADD=00,         +
              NOTPART=(CSS(1),LP14A)
*
* Receive FCTC Control Unit and Device Definitions from CTC image ID 01
* (CUADD value can be 01 or 1)
*
 CNTLUNIT CUNUMBR=5010,PATH=((CSS(0),51),(CSS(1),53)),                +
              LINK=((CSS(0),C0),(CSS(1),C2)),CUADD=01,                +
              UNITADD=((00,8)),UNIT=FCTC
 IODEVICE ADDRESS=(5010,8),CUNUMBR=5010,UNIT=FCTC,UNITADD=00,         +
              NOTPART=(CSS(0),LP01A)
*
* Receive FCTC Control Unit and Device Definitions from CTC image ID 02
* (CUADD value can be 02 or 2)
*
 CNTLUNIT CUNUMBR=5020,PATH=((CSS(0),51),(CSS(1),53)),                +
              LINK=((CSS(0),C0),(CSS(1),C2)),CUADD=2,                 +
              UNITADD=((00,8)),UNIT=FCTC
 IODEVICE ADDRESS=(5020,8),CUNUMBR=5020,UNIT=FCTC,UNITADD=00,         +
```

```
              NOTPART=(CSS(0),LP02A)
*
* Receive FCTC Control Unit and Device Definitions from CTC image ID 03
* (CUADD value must be 13 for CSS ID 1 and MIF image ID 3)
*
 CNTLUNIT CUNUMBR=5030,PATH=((CSS(0),51),(CSS(1),53)),                 +
              LINK=((CSS(0),C0),(CSS(1),C2)),CUADD=13,                 +
              UNITADD=((00,8)),UNIT=FCTC
 IODEVICE ADDRESS=(5030,8),CUNUMBR=5030,UNIT=FCTC,UNITADD=00,          +
              NOTPART=(CSS(1),LP13A)
*
* Receive FCTC Control Unit and Device Definitions from CTC image ID 04
* (CUADD value must be 14 for CSS ID 1 and MIF image ID 4)
*
 CNTLUNIT CUNUMBR=5040,PATH=((CSS(0),51),(CSS(1),53)),                 +
              LINK=((CSS(0),C0),(CSS(1),C2)),CUADD=14,                 +
              UNITADD=((00,8)),UNIT=FCTC
 IODEVICE ADDRESS=(5040,8),CUNUMBR=5040,UNIT=FCTC,UNITADD=00,          +
              NOTPART=(CSS(1),LP14A)
*
**********************************************
* CTC connections with SWITCH=01 to System B *
**********************************************
*
* Send FCTC Control Unit and Device Definitions to CTC image ID 21
*
 CNTLUNIT CUNUMBR=4210,PATH=((CSS(0),50),(CSS(1),52)),                 +
              LINK=((CSS(0),D1),(CSS(1),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=((CSS(0),50),(CSS(1),52)),                 +
              LINK=((CSS(0),D1),(CSS(1),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=((CSS(0),50),(CSS(1),52)),                 +
              LINK=((CSS(0),D1),(CSS(1),D1)),CUADD=3,                  +
              UNITADD=((00,8)),UNIT=FCTC
 IODEVICE ADDRESS=(4230,8),CUNUMBR=4230,UNIT=FCTC,UNITADD=00
*
* Receive FCTC Control Unit and Device Definitions from CTC image ID 21
*
 CNTLUNIT CUNUMBR=5210,PATH=((CSS(0),51),(CSS(1),53)),                 +
              LINK=((CSS(0),D0),(CSS(1),D0)),CUADD=1,                  +
              UNITADD=((00,8)),UNIT=FCTC
 IODEVICE ADDRESS=(5210,8),CUNUMBR=5210,UNIT=FCTC,UNITADD=00
*
* Receive FCTC Control Unit and Device Definitions from CTC image ID 22
*
 CNTLUNIT CUNUMBR=5220,PATH=((CSS(0),51),(CSS(1),53)),                 +
              LINK=((CSS(0),D0),(CSS(1),D0)),CUADD=2,                  +
              UNITADD=((00,8)),UNIT=FCTC
 IODEVICE ADDRESS=(5220,8),CUNUMBR=5220,UNIT=FCTC,UNITADD=00
*
* Receive FCTC Control Unit and Device Definitions from CTC image ID 23
*
 CNTLUNIT CUNUMBR=5230,PATH=((CSS(0),51),(CSS(1),53)),                 +
              LINK=((CSS(0),D0),(CSS(1),D0)),CUADD=3,                  +
              UNITADD=((00,8)),UNIT=FCTC
 IODEVICE ADDRESS=(5230,8),CUNUMBR=5230,UNIT=FCTC,UNITADD=00
*
************************************************
```

```
* Secondary CTC connections for LP14A and LP3B *
************************************************
*
* Send FCTC Control Unit and Device Definitions to CTC image ID 23
* (Destination CHPID is unshared so no CUADD is required)
*
 CNTLUNIT CUNUMBR=4238,PATH=(CSS(1),54),LINK=D3,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(4238,8),CUNUMBR=4238,UNIT=FCTC,UNITADD=00
*
* Receive FCTC Control Unit and Device Definitions from CTC image ID 23
*(Destination CHPID is unshared so no CUADD is required)
*
 CNTLUNIT CUNUMBR=5238,PATH=(CSS(1),55),LINK=D2,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=01,PART=LP3B
 CHPID PATH=63,TYPE=FC,SWITCH=01,PART=LP3B
*
**********************************
* CTC connections with SWITCH=01 *
**********************************
*
**************************************************************
* 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 Control Unit 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 Control Unit 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 Control Unit 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
*
**********************************************
* CTC connections with 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
* (CUADD value must be 13 for CSS ID 1 and MIF image ID 3)
*
 CNTLUNIT CUNUMBR=4030,PATH=60,LINK=C3,CUADD=13,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
* (CUADD value must be 14 for CSS ID 1 and MIF image ID 4)
*
 CNTLUNIT CUNUMBR=4040,PATH=60,LINK=C3,CUADD=14,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(4040,8),CUNUMBR=4040,UNIT=FCTC,UNITADD=00
*
* Receive FCTC Control Unit 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 Control Unit 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 Control Unit and Device Definitions from CTC image ID 03
* (CUADD value must be 13 for CSS ID 1 and MIF image ID 3)
*
 CNTLUNIT CUNUMBR=5030,PATH=61,LINK=C2,CUADD=13,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(5030,8),CUNUMBR=5030,UNIT=FCTC,UNITADD=00
*
* Receive FCTC Control Unit and Device Definitions from CTC image ID 04
* (CUADD value must be 14 for CSS ID 1 and MIF image ID 4)
*
 CNTLUNIT CUNUMBR=5040,PATH=61,LINK=C2,CUADD=14,UNITADD=((00,8)),      +
               UNIT=FCTC
 IODEVICE ADDRESS=(5040,8),CUNUMBR=5040,UNIT=FCTC,UNITADD=00
*
************************************************
* Secondary CTC connections for LP3B and LP14A *
************************************************
*
* Send FCTC Control Unit and Device Definitions to CTC image ID 04
* (Destination CHPID is unshared so no CUADD is required)
*
 CNTLUNIT CUNUMBR=4038,PATH=62,LINK=C5,UNITADD=((00,8)),UNIT=FCTC
 IODEVICE ADDRESS=(4038,8),CUNUMBR=4038,UNIT=FCTC,UNITADD=00
*
* Receive FCTC Control Unit and Device Definitions from CTC image ID 04
* (Destination CHPID is unshared so no CUADD is required)
*
 CNTLUNIT CUNUMBR=5038,PATH=63,LINK=C4,UNITADD=((00,8)),UNIT=FCTC
 IODEVICE ADDRESS=(5038,8),CUNUMBR=5038,UNIT=FCTC,UNITADD=00
```

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Avis de conformlté aux normes du ministère des Communications du Canada

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IBM Technical Regulations
Pascalstr. 100, Stuttgart, Germany 70569
Telephone: 0049 (0) 711 785 1176
Fax: 0049 (0) 711 785 1283
email: tjahn@de.ibm.com

EC Declaration of Conformity (In German)

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Dieses Produkt entspricht den Schutzanforderungen der EU-Richtlinie 89/336/EWG zur Angleichung der Rechtsvorschriften über die elektromagnetische Verträglichkeit in den EU-Mitgliedsstaaten und hält die Grenzwerte der EN 55022 Klasse A ein.

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Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG) vom 18. September 1998 (bzw. der EMC EG Richtlinie 89/336) für Geräte der Klasse A.

Dieses Gerät ist berechtigt, in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen.

Verantwortlich für die Konformitätserklärung nach Paragraf 5 des EMVG ist die IBM Deutschland GmbH, 70548 Stuttgart.

Informationen in Hinsicht EMVG Paragraf 4 Abs. (1) 4:

Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022 Klasse A.

update: 2004/12/07

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声 明

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- The *Dictionary of Computing*, SC20-1699.
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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

AC. Action code.

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*.

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*.

bit. Either of the digits 0 or 1 when used in the binary numeration system. (T) See also *byte*.

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)

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.

C

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.

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 address. In System/370 mode, the 8 leftmost bits of an input/output address that identify the channel. See also *device address* and *input/output address*.

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 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.

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 set. In System/370 mode, a collection of channels that can be addressed concurrently by a central processor. See also *channel subsystem*.

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.

CHP. Channel path.

CHPID. Channel path identifier.

CMS. Conversational monitor system.

CNC. Mnemonic for an ESCON channel attached to an ESCON-capable device.

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.

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*.

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 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.

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.

CP. Central processor.

CPC. central processor complex.

CRW. Channel report word.

CTC. (1) Channel-to-channel. (2) Mnemonic for an ESCON channel attached to another ESCON channel.

CU. Control unit.

CUA. Control unit address.

CVC. Mnemonic for an ESCON channel attached to a 9034.

D

DASD. Direct access storage device.

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.

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.

default. Pertaining to an attribute, value, or option that is assumed when none is explicitly specified. (I)

device. A mechanical, electrical, or electronic contrivance with a specific purpose.

device address. In System/370 mode, the 8 rightmost bits of an I/O address that identify a particular I/O device and a control unit on the designated channel. See *channel address, device-level addressing,* and *input/output address*.

device identifier. In a channel subsystem, an address, not apparent to the program, that is used to communicate with I/O devices. See also *channel path identifier, device number, input/output address*, and *subchannel number*.

Note: In System/370 mode, the device identifier is called a device address and consists of an 8-bit value.

device number. In a channel subsystem, four hexadecimal digits that uniquely identify an I/O device.

direct access storage device (DASD). A device in which access time is effectively independent of the location of the data.

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).

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*.

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. (1) An occurrence or happening. (2) An occurrence of significance to a task; for example, the completion of an asynchronous operation, such as an input/output operation.

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.

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.

fiber. See *optical fiber*.

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)

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*.

H

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 9672 and 9674 central processor complexes (CPCs).

hex. Hexadecimal.

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.

host. In interpretive execution mode, the real machine as opposed to the virtual or interpreted machine (the guest).

I

IBM System z. An umbrella name used to include all IBM System z9 and IBM @server zSeries servers.

IBM System z9. The name used to include IBM System z9 Enterprise Class (z9 BC) and IBM System z9 Business Class (z9 BC) servers.

IBM System z9 Enterprise Class (z9 EC). The name for the server formerly named the IBM System z9 109 (z9-109).

ICE. Interconnect communication element.

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*.

IML. Initial machine load.

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 a work day or after a system malfunction. (3) 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 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 OS/390® LPs) running on the same central processor complex to assist in the test and development of data sharing applications.

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.

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.

IPL. Initial program load.

J

JCL. Job control language.

job control language (JCL). A control language used to identify a job to an operating system and to define the job's requirements.

L

LAN. Local area network.

LCU. Logical control unit.

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.

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*.

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.

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*.

logical control unit. 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. Logical control units represent to the channel subsystem a set of control units that attach common I/O devices.

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*.

LP. Logical partition.

LPAR. Logically partitioned.

M

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.

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.

N

network. (1) An arrangement of nodes and connecting branches. (T) (2) A configuration of data processing devices and software connected for information exchange.

O

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)

option. (1) A specification in a statement that may be used to influence the execution of the statement. (2) A hardware or software function that can be selected or enabled as part of a configuration process. (3) Hardware (such as a network adapter) that can be installed in a device to change or enhance device functions.

OS. Operating system.

P

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 having a System/360 and System/370 channel-to-control-unit I/O interface that uses bus-and-tag cables as a transmission medium. 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*.

path. In a network, any route between any two nodes. (T)

PC. Parity check.

PCE. Processor controller.

physical address. The absolute address after configuration (the final address). See also *absolute address, logical address, real address*, and *virtual address*.

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.

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/System 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.

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™™.

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.

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.

S

SA. (1) System area. (2) Stand-alone.

SCH. Subchannel.

SE. Support element.

service representative. A person who performs maintenance services for IBM hardware products or systems. See also *IBM program support representative*.

SNA. Systems Network Architecture.

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)

subchannel. In 370-XA and ESA/390 modes, the facility that provides all of the information necessary to start, control, and complete an I/O operation.

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).

SYSGEN. System generation.

SYSRESET. System reset.

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 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 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*.

System z. See **IBM System z**.

System z9. See **IBM System z9**.

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

time-out. (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.

TPC. Transaction processing facility.

U

unit address. The last two hexadecimal digits of a device address or a device number.

Note: Often used interchangeably with control unit address and device address in System/370 mode.

V

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 Machine/System Product (VM/SP). An IBM licensed program that manages the resources of a single computer so that multiple computing systems appear to exist. Each virtual machine is the functional equivalent of a “real” machine.

VM. Virtual machine.

VM/SP. Virtual Machine/System Product.

VS. Virtual storage.

VSE. Virtual storage extended.

VTAM®. Virtual telecommunications access method.

Index

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