eserver Cluster 1600

High Performance Switch Planning, Installation, and Service for IBM eserver p5 servers

SA38-0646-02

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Note:
Before using this information and the product it supports, read the information in “Safety and environmental notices” on page xvii and “Notices” on page 485.

Third edition (October 2005)

This edition replaces SA38-0646-01. Significant changes or additions to the text or illustrations are indicated by a vertical line (|) to the left of the change.

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Safety and environmental notices

Safety notices (in English)

For general information concerning safety, refer to *Electrical Safety for IBM® Customer Engineers* (S229-8124). For a copy of this publication, contact your IBM marketing representative or the IBM branch office serving your locality.

The following is a list of all safety notices (in English only) pertaining to hardware maintenance tasks in this publication. Translations of each of the safety notices into other languages are included in *eserver: Safety Notices* (G229-9054).

DANGER notices warn you of conditions or procedures that can result in death or severe personal injury.

CAUTION notices warn you of conditions or procedures that can cause personal injury that is neither lethal nor extremely hazardous.

Each notice contains a reference number (such as *DXXX*) which you can use to help find a specific notice in other languages.

Danger notices

DANGER

To prevent a possible shock from touching two surfaces with different protective ground (earth), use one hand, when possible, to connect or disconnect signal cables. (D001)

DANGER

Overloading a branch circuit is potentially a fire hazard and a shock hazard under certain conditions. To avoid these hazards, ensure that your system electrical requirements do not exceed branch circuit protection requirements. Refer to the information that is provided with your device or the power rating label for electrical specifications. (D002)

DANGER

If the receptacle has a metal shell, do not touch the shell until you have completed the voltage and grounding checks. Improper wiring or grounding could place dangerous voltage on the metal shell. If any of the conditions are not as described, STOP. Ensure the improper voltage or impedance conditions are corrected before proceeding. (D003)

DANGER

An electrical outlet that is not correctly wired could place hazardous voltage on the metal parts of the system or the devices that attach to the system. It is the responsibility of the customer to ensure that the outlet is correctly wired and grounded to prevent an electrical shock. (D004)

DANGER

Electrical voltage and current from power, telephone, and communication cables are hazardous.

To avoid a shock hazard:

- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**
- **Connect all power cords to a properly wired and grounded electrical outlet. Ensure outlet supplies proper voltage and phase rotation according to the system rating plate.**
- **Connect any equipment that will be attached to this product to properly wired outlets.**
- **When possible, use one hand only to connect or disconnect signal cables.**
- **Never turn on any equipment when there is evidence of fire, water, or structural damage.**
- **Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.**
- **Connect and disconnect cables as described below when installing, moving, or opening covers on this product or attached devices.**

  To Disconnect:

  1. **Turn everything OFF (unless instructed otherwise).**
  2. **Remove power cords from the outlet.**
  3. **Remove signal cables from connectors.**
  4. **Remove all cables from devices.**

  To Connect:

  1. **Turn everything OFF (unless instructed otherwise)**
  2. **Attach all cables to devices.**
  3. **Attach signal cables to connectors.**
  4. **Attach power cords to outlet.**
  5. **Turn device ON.**

  (D005)

Caution notices

CAUTION:
Energy hazard present. Shorting may result in system outage and possible physical injury. Remove all metallic jewelry before servicing. (C001)

CAUTION:
Lead-acid batteries can present a risk of electrical burn from high, short-circuit current. Avoid battery contact with metal materials; remove watches, rings, or other metal objects, and use tools with insulated handles. To avoid possible explosion, do not burn. Exchange only with the IBM-approved part. Recycle or discard the battery as instructed by local regulations. In the United States, IBM has a process for the collection of this battery. For information, call 1-800-426-4333. Have the IBM part number for the battery unit available when you call. (C004)

CAUTION:
This part or unit is heavy, but has a weight smaller than 18 kg (39.7 lb.). Use care when lifting, removing, or installing this part or unit. (C008)

CAUTION:

or

The weight of this part or unit is between 18 and 32 kg (39.7 and 70.5 lb.). It takes two persons to safely lift this part or unit. (C009)

CAUTION:

or

The weight of this part or unit is between 32 and 55 kg (70.5 and 121.2 lb.). It takes three persons to safely lift this part or unit. (C010)

CAUTION:
The doors and covers to the product are to be closed at all times except for service by trained service personnel. All covers must be replaced and doors locked at the conclusion of the service operation. (C013)

CAUTION:
The system contains circuit cards and/or assemblies that contain lead solder. To avoid the release of lead (Pb) into the environment, do not burn. Discard the circuit card as instructed by local regulations. (C014)

CAUTION:
Do not remove or install this unit without using the provided lift tool. (C017)

CAUTION:
This product is equipped with a 4-wire (three-phase and ground) power cable. Use this power cable with a properly grounded electrical outlet to avoid electrical shock. (C019)

CAUTION:
Ensure the building power circuit breakers are turned off *BEFORE* you connect the power cord(s) to the building power. (C023)

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

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

CAUTION:
The power-control button on the device does not turn off the electrical current supplied to the device. The device might also have more than one connection to dc power. To remove all electrical current from the device, ensure that all connections to dc power are disconnected at the dc power input terminals. (C031)

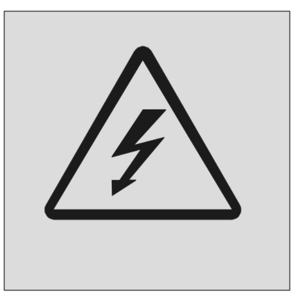
CAUTION:
Servicing of this product or unit is to be performed by trained service personnel only. (C032)

Labels

L004 DANGER

High voltage present.

(L004)

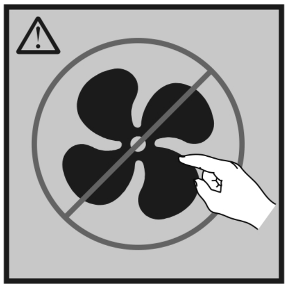


L005 CAUTION:
High energy present.

(L005)

L008 CAUTION:
Hazardous moving parts nearby.

(L008)



Laser safety information

This product might contain certain communication adaptors, such as fiber optic based Switch Port Connection cards and use lasers.

Laser Compliance

All lasers are certified in the U.S. to conform to the requirements of DHHS 21 CFR Subchapter J for class 1 laser products. Outside the U.S., they are certified to be in compliance with the IEC 825 as a class 1 laser product (internal modules are class 1m). Consult the label on each part for laser certification numbers and approval information.

Environmental notices

Product recycling and disposal

CAUTION:
The system contains circuit cards and/or assemblies that contain lead solder. To avoid the release of lead (Pb) into the environment, do not burn. Discard the circuit card as instructed by local regulations. (C014)

This unit contains materials such as circuit boards, cables, electromagnetic compatibility gaskets and connectors which may contain lead and copper/beryllium alloys that require special handling and disposal at end of life. Before this unit is disposed of, these materials must be removed and recycled or discarded according to applicable regulations. IBM offers product-return programs in several countries. Information on product recycling offerings can be found on the IBM Internet site at http://www.ibm.com/ibm/environment/products/prp.shtml.

IBM encourages owners of information technology (IT) equipment to responsibly recycle their equipment when it is no longer needed. IBM offers a variety of programs and services to assist equipment owners in recycling their IT products. Information on product recycling offerings can be found on the IBM Internet site at http://www.ibm.com/ibm/environment/products/prp.shtml.

Battery return program

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

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

In the Netherlands the following applies:

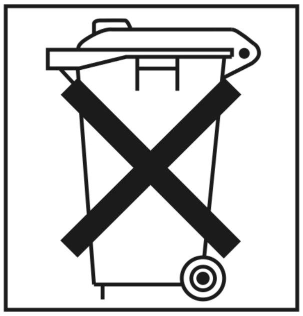


Figure 1. Recycling icon

Cable warning

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

About this book

Attention: The information in this document is specific to configurations using IBM eserver p5 servers that are compatible with the IBM eserver High Performance Switch. This information does not apply to other server types or clusters having a mixture of server types.

Part 1 of this book provides planning information for installing the HPS into a Cluster 1600 system. Early planning gives you the opportunity to make alterations to your site, order any necessary additional components, and reduce the time it takes to install your system. An organized plan helps ensure that your system is configured in the most efficient manner to best suit your particular needs.

Part 2 of this book provides diagnostic and repair information for the HPS in a Cluster 1600 system. The information in Part 2 includes:

- Identification of field replaceable unit (FRU) locations
- Isolation of failures using Maintenance Analysis Procedures (MAPs)
- Hardware diagnostic procedures
- Device-specific configuration procedures
- Switch hardware removal and replacement procedures

Save this book

Retain this book with your original Cluster 1600 system. This book emphasizes recent system hardware and does not include complete information on previous hardware releases.

Who should use this book

This book is intended for those technical professionals responsible for planning the installation of Cluster 1600 systems and product-trained service personnel responsible for system installation and maintenance.

Related information

This book and other hardware and software documentation for IBM eserver p5 servers, eserver pSeries® servers, RS/6000® systems, and RS/6000 SP™ systems are available both online and, for some books, in printed form from the following sources:

- The Web site at **http://publib.boulder.ibm.com/infocenter/clresctr/index.jsp**
- The Web site at **http://publib.boulder.ibm.com/infocenter/pseries/index.jsp**

Accessibility information

You can find accessibility information for IBM eserver systems online. Visit the IBM eserver AIX® and pSeries Information Center at **http://publib16.boulder.ibm.com/pseries/en_US/infocenter/base**. To view the associated information, click AIX and pSeries accessibility in the left navigation bar.

User's responsibilities

Before calling IBM for service, the system administrator should use AIX problem determination procedures for initial problem determination. If there is nothing wrong with the customer operating procedures, customer-supplied cables, or the power source, the customer should then call IBM for service.

How to send your comments

Your feedback is important in helping to provide the most accurate and highest quality information. If you have any comments about this book:

- Send your comments by e-mail to **mhvrcfs@us.ibm.com**. Be sure to include the name of this book, the order number of the book, and, if applicable, the specific location of the text you are commenting on (for example, a page number or table number).
- Fill out one of the forms at the back of this book and return it by mail, by fax, or by giving it to an IBM representative.

Summary of changes

SA38-0646-02

Changes made since the previous edition (SA38-0646-01) are indicated throughout this book by a vertical bar on the left margin of the page. Changes in this edition include:

- **New information:**
  - Added support for redundant cluster service networks
  - Added graphics for redundant cluster service networks
- **Updated information:**
  - Revised hardware installation procedures
  - Added notes for DHCP configuration
  - Added notes for frame authentication password

SA38-0646-01

Changes made since the previous edition (SA38-0646-00) are indicated throughout this book by a vertical bar on the left margin of the page. Changes in this edition include:

- **New information:**
  - Introductory information for switch network cable planning
  - MAP details for network performance problems
- **Updated information:**
  - Software levels
  - Switch cable planning
  - Software installation
  - Network verification procedures
  - Installation complete procedures

Part 1. High Performance Switch Planning

Part 1 of this book is contains planning information for installing the High Performance Switch (HPS) into a Cluster 1600 system configured with IBM @server p5 servers. Planning information is presented in the following chapters:

Chapter 1. High Performance Switch overview

The IBM @server High Performance Switch (HPS) communication subsystem is an evolutionary step in network data transfers using technology based on the proven architecture of the SP Switch2. The technology driving the HPS is designed to augment the latest offerings of IBM eServer™ clustered servers by increasing the communication bandwidth between servers and partitions within the cluster. The benefits of implementing this new communication subsystem include many enhancements over previous SP switch offerings such as:

- Configuration options include single network or dual network switching
- Significantly improved communication bandwidth and reductions in latency
- The option to use either fiber optic or copper cables for a variety of switch network connections
- Improved reliability, availability, and serviceability (RAS)

Note: The HPS is the first offering in a new generation of switch technology. As such, it does not support migration from, nor coexistence with previous versions of SP switch networks.

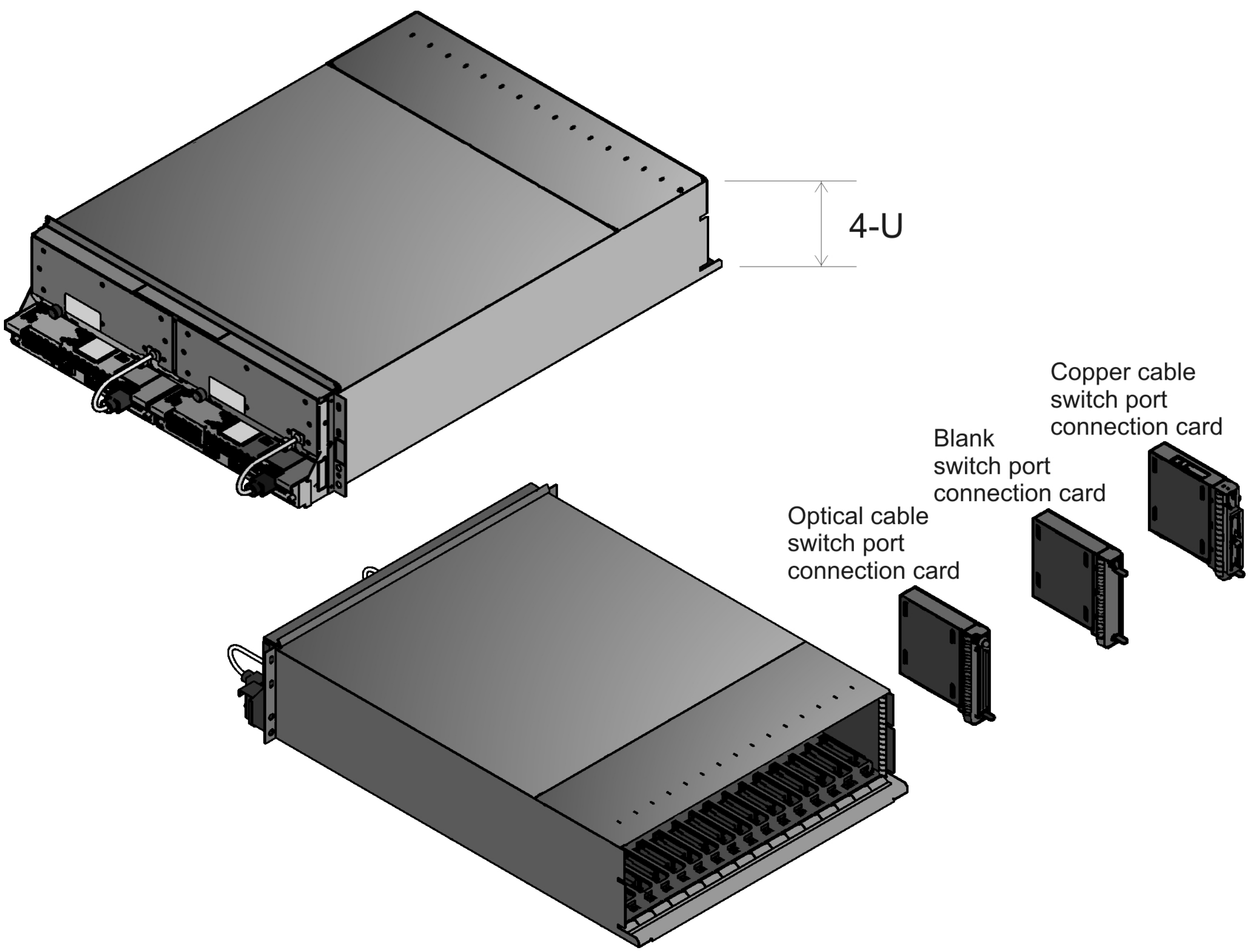


Figure 2. The High Performance Switch (M/T 7045-SW4)

Switch network overview

Attention: The information in this document is specific to configurations using IBM @server p5 servers that are compatible with the IBM @server High Performance Switch. This information does not apply to other server types or clusters having a mixture of server types.

With the HPS, all network connections pass through a revolutionary interface card called the Switch Network Interface (SNI). There are several SNI feature types and each feature is designed for a specific server type. Each SNI and server combination supports a different number of switch network links using either copper switch cables or fiber optic switch cables. These SNI features are packaged as:

- 1-Link Switch Network Interface
  - Supported on IBM @server p5 590 and IBM @server p5 595 servers
  - Configured for fiber optic switch cables
  - 1-Link SNIs **must** be ordered in pairs
- 2-Link Switch Network Interface
  - Non-interchangeable features designed for IBM @server p5 575 servers
  - All feature types configured for copper switch cables

The SNI design allows each link to pass messages between the server bus and the switch. Therefore, each link provides a function similar to a previous SP type switch adapter. In addition, the internal structure of the SNI gives you the flexibility to configure the network with either single network with all switches connected over one switch fabric or a two network system featuring parallel, independent switch fabrics. These architectural improvements in the SNI and the HPS create a distinct difference in switch networks when compared to previous adapters and switches.

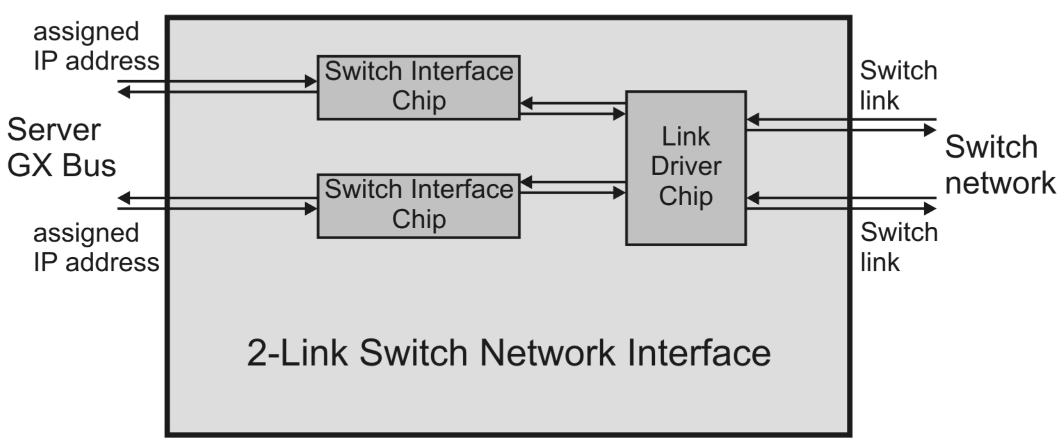


Figure 3. Conceptual view of a 2-Link SNI card

Topology overview

An HPS may be configured as either a Node Switch Board (NSB) for server-to-switch communication or as an Intermediate Switch Board (ISB) for switch-to-switch communication across large networks. The HPS also provides you with the option to configure switches into a single network or a dual network system.

The basic topology for all HPS networks consists of a switch connected to server mounted SNIs. One of the prerequisites for these networks is that the servers must be configured with one or more Logical Partitions (LPARs). In addition, any LPAR connected to the switch must be connected to the network using one or more SNI link pairs. Link pairs also have some prerequisites for how they are used:

- If the SNI is a 2-Link SNI, both links from that SNI must be assigned to the same LPAR
  - A link pair cannot be created from two separate 2-Link SNIs

- If the SNI is a 1-Link SNI; all 1-Link SNIs must be ordered as pairs and both links associated with that pair must be assigned to the same LPAR
- If you are configuring a two network system, one link from each link pair must be assigned to each of the networks
  – Stated another way, if you are configuring a two network system, each LPAR must be connected to both networks

Each SNI link pair must be assigned to the server LPAR according to device assignment rules. However, the assignment rules provide significantly improved flexibility for allocating system resources. For example, you can create a system with:

- The maximum number of LPARs connected to the switch by assigning one link pair to each LPAR
- Maximum network bandwidth by assigning up to four link pairs to each LPAR

Single networks

Standard single network configurations provide any increment of links up to 128 links (64 link pairs). These standard configurations require one to eight NSBs and may require either two or four ISBs. With a single network configuration, all NSBs and ISBs are either directly or indirectly interconnected. If a single network system has three or less switches, you must configure them as NSBs and directly connect them to each other. If the network has four to eight NSBs, ISBs are also required and you must indirectly connect the NSBs to each other through the ISBs. Refer to Table 1 on page 6 for the available configuration options and to “Network cable routing comparisons” on page 7 for illustrations comparing network configurations.

Single network configuration summary:

- A single network configuration has all switches directly interconnected through the switch fabric.
- Small networks having either 2 to 16 links or 34 to 48 links may be more economical in a single network configuration. For example, a network with 2 to 16 links requires one NSB in a single network configuration. However, the same system would require two NSBs in a dual network configuration. Because the dual network requires an additional NSB, this configuration would have a higher initial expense. However, the initial expense may be offset if you expand the network in the future.
- Because single network systems require ISBs for medium sized networks, some single network configurations can cost more than a dual network system of the same size. For example, a single network configuration with 50 to 64 links requires four NSBs and two ISBs while a dual network configuration of the same size only requires four NSBs; ISBs are not required.

Note: If you expand a single network system and that expansion requires the addition of ISBs, you will have to reconfigure the existing network when the ISBs are added. Therefore, if you are starting with a small network but have plans for network expansion, you may want to consider starting with a dual network configuration.

Dual networks

In a dual network configuration, each network has its own switch fabric. As a result, each network in a dual network system has a configuration similar to a single network that is half the size of the complete dual network system. For example, a dual network system having 6 NSBs features parallel fabrics that are configured like two, single network systems having 3 NSBs each. Both single network and dual network configurations allow up to 128 links on each network. In other words, a single network configuration may have up to 128 links while a dual network configuration may have a total of up to 256 links.

Table 2 on page 6 defines the allowable switch and link configurations for dual network systems. The illustrations in “Network cable routing comparisons” on page 7 show the differences between single network and dual network systems.

Note: Each network in a dual network system is completely independent of the other network. A message on one network cannot be passed to the other network. In addition, all software components running on the servers also see each network as a separate.

Dual network configuration summary:

- Since ISBs are not required for most dual network systems, this configuration can provide significant cost savings when compared to most single network systems having the same number of links.
- Because most dual network systems do not require ISBs, it is typically easier to add switches to a dual network system than it is to add switches to a single network system of the same size.
- Each network in a dual network system has its own switch fabric and messages cannot pass between the networks.
- In a dual network system, switches must be added in pairs and the number of switches on each network must be equal. Because switches must be added in pairs:
  - Dual network systems are limited to configurations having an even number of switches.
  - For two specific network sizes, a dual network system requires more NSBs than a single network configuration:
    1. 2 to 16 links
    2. 34 to 48 links
- The number of links on each network of a dual network system must be equal.
- One link from each SNI link pair must be assigned to each network of a dual network system.

Topology comparisons

The information in this section provides a quick comparison of single and dual network configurations:

- The information in "Link and switch board requirements" compares the number of NSBs and ISBs required for single and dual networks having the same number of links in each configuration
- The information in "Network cable routing comparisons" on page 7 illustrates switch cable requirements for networks having the same number of links

Link and switch board requirements: The tables in this section list the requirements for Node Switch Boards (NSBs) and Intermediate Switch Boards (ISBs) for each supported link range.

- Table 1 lists the requirements for single network configurations
- Table 2 lists the requirements for dual network configurations

Table 1. Switch board requirements for single network systems

Links in system	NSBs required per system	ISBs required per system
2 to 16 links	1	0
18 to 32 links	2	0
34 to 48 links	3	0
50 to 64 links	4	2
66 to 80 links	5	4
82 to 96 links	6	4
98 to 112 links	7	4
114 to 128 links	8	4
Note: Larger network configurations are available through special order.		

Table 2. Switch board requirements for dual network systems

Links		NSBs required		ISBs required	
Per network	Per system	Per network	Per system	Per network	Per system
1 to 16	2 to 32	1	2	0	0
17 to 32	34 to 64	2	4	0	0
33 to 48	66 to 96	3	6	0	0
49 to 64	98 to 128	4	8	2	4

Table 2. Switch board requirements for dual network systems (continued)

Links		NSBs required		ISBs required	
Per network	**Per system**	**Per network**	**Per system**	**Per network**	**Per system**
65 to 80	130 to 160	5	10	4	8
81 to 96	162 to 192	6	12	4	8
97 to 112	194 to 224	7	14	4	8
113 to 128	226 to 256	8	16	4	8

Notes:
1. Dual network systems may have an odd number of links per network because link pairs are split between the two networks.
2. Larger network configurations are available through special order.

Network cable routing comparisons: Figure 4 on page 8 and Figure 5 on page 9 illustrate the differences between single and dual network configurations having a similar number of server links. Each illustration shows the high-level requirements for Intermediate Switch Boards and server-to-switch cables for network configurations having the same number of Node Switch Boards. Single network configurations with one, five, and seven NSBs are not illustrated but they are available.

Note: The number next to each cable route in Figure 4 and Figure 5 represent the quantity of server-to-switch cables in each group.

Figure 6 on page 10 provides an overview of the server-to-switch cable layout for a two network configuration having four ISBs, eight NSBs, and 256 links. Two network configurations with four, five, six, and seven NSBs per network are not illustrated. Those networks also require four ISBs and have a similar server-to-switch cable configuration. However, those networks would require fewer server-to-switch cables for each ISB.

Notes:
1. Figure 6 shows a typical layout for dual networks having four ISBs per network.
2. Dual networks with four ISBs but fewer than eight NSBs, have the same general layout. However, a similar system configured with less than eight NSBs will also have fewer server-to-switch cables associated with each ISB.
3. The number next to the cable routes represents the quantity of server-to-switch cables in each group.

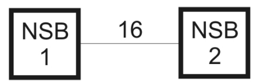
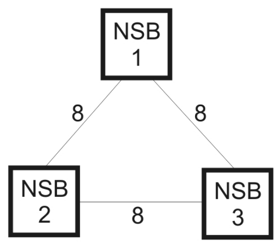
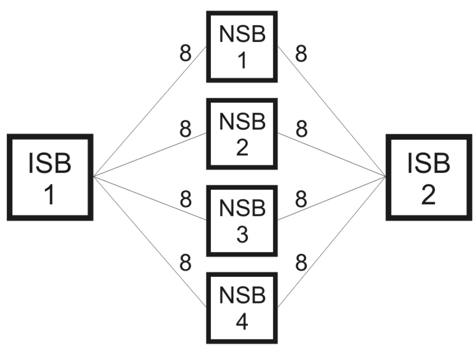
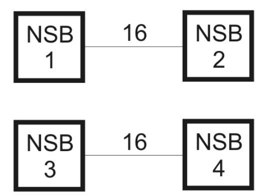
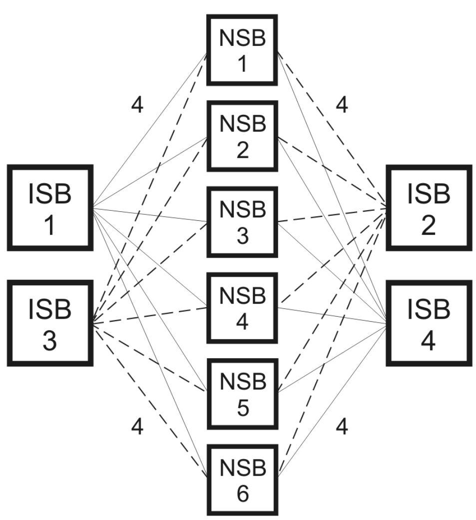
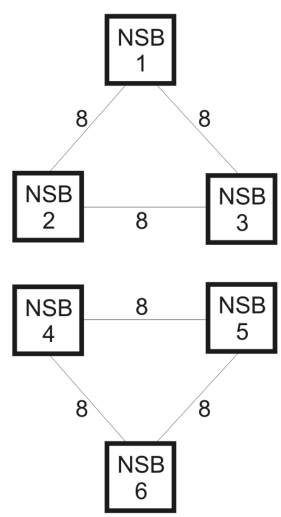
NSBs in network	Single network	Dual network
2		
3		Not available
4		
6		

Figure 4. Cable routing comparison for various single and dual network configurations

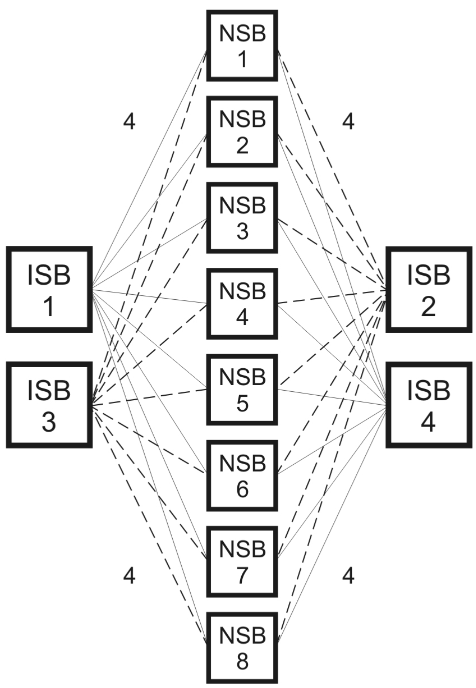
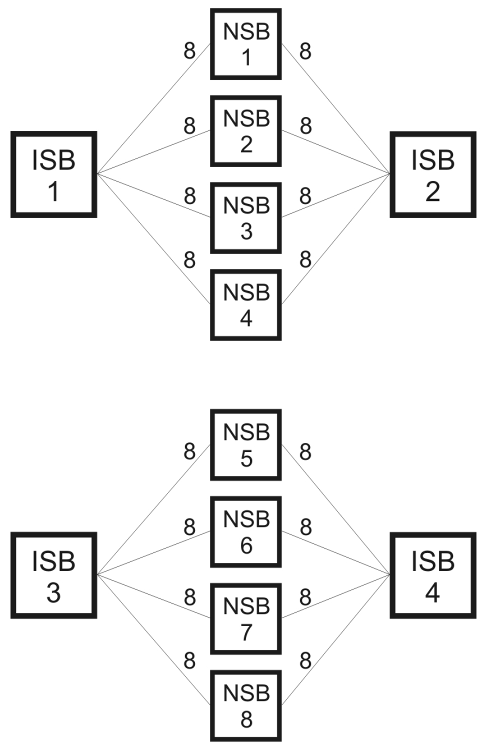
<table>
<tr><th>NSBs in network</th><th>Single network</th><th>Dual network</th></tr>
<tr><td>8</td><td>
</td><td>
</td></tr>
</table>

Figure 5. Cable routing comparison for single and dual networks with eight NSBs

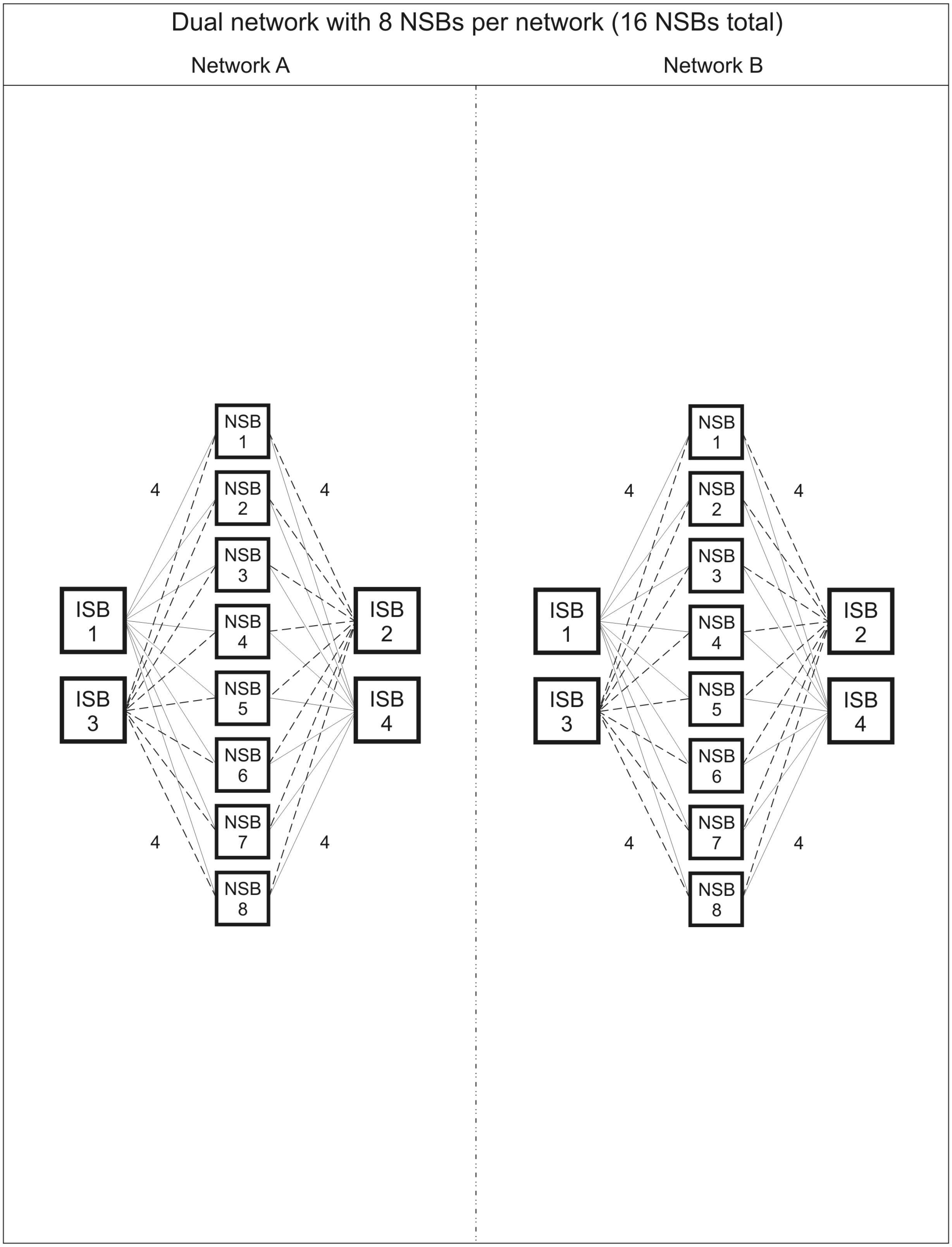


Figure 6. Cable routing overview for a dual network with four ISBs per network

Link overview

The previous information provided a brief description of the relationship between the HPS, the servers, and the Switch Network Interfaces that link the network together. As you think about setting up your network, it is important to keep in mind that there are two sides to every link, the server side and the switch side.

Server side

On the server side of the network link, the message passes from the server into the Switch Network Interface (SNI). As you configure the network, you must assign a separate IP address to each link on the server side of the network. Therefore, **all** 1-Link SNI *pair* and each 2-Link SNI requires two IP addresses. In addition, these IP addresses must be assigned in pairs and the pairs cannot be shared or split between servers or Logical Partitions (LPARs). Because the server side of the link is critical for IP configuration, you can think of it as if it were a software component. Because of that, the server side of the link is not counted when you are adding up the number of hardware links in the network.

Note: 1-Link SNIs for p5-590 and p5-595 servers must be ordered in pairs and configured as pairs when they are installed in the servers.

Switch side

On the switch side of the network link, the message passes out of the Switch Network Interface and into the actual switch fabric. Since there is visible hardware on the switch side of the network link, you can think of the switch side as if it were the hardware component of the network link. Because of that, each cable connecting an external port on an SNI and a port on a switch port connector card represents one physical network link. These are the links that you must count when you are adding up the number of links in the network. The hardware components making up *one link* on the switch side of the network include:

- One of the external ports on a 1-Link or 2-Link SNI
- One of the two external switch ports on a Switch Port Connector card
- The switch cable connecting the external SNI port to the external port on the Switch Port Connector card

In a typical network configuration, the external ports on an SNI are assigned in pairs to a server or LPAR. These hardware link pairs on the switch side of the SNI correspond to the IP address link pairs on the server side of that SNI. Once the pair of hardware links have been assigned to a server or LPAR, that external hardware link pair cannot be shared with another server or LPAR. Depending on the server type, a server or LPAR may have one, two, three, or four link pairs assigned on the switch side of the link.

HPS hardware overview

Notes:

1. The information in this document is specific to configurations using HPS compatible IBM @server p5 servers. For information on other server types, refer to the appropriate documentation.
2. To accommodate cable installation and to meet radiated EMI emission limits, clustered servers configured with the HPS **must** be installed in a raised floor facility.

Clustered servers configured with the HPS (M/T 7045-SW4) must have the following hardware components:

- HPS
  – Each IBM @server p5 575 server frame may have either one or two switches installed
    - Switches mounted in p5-575 server frames must be configured as Node Switch Boards (NSB) for server-to-switch communication. Intermediate Switch Board (ISB) configurations are not permitted in these frames.
  – Only one NSB may be installed in each IBM @server p5 590 or IBM @server p5 595 server frame

  - Switches mounted in p5-590 or p5-595 server frames must be configured as NSBs. ISB configurations are not permitted in these frames.
- Additional switches must be mounted in a separate 7045-SW4 switch-only frame (FC 5792 or FC 5792/8691)
  - Switches in a switch-only frame may be configured as either Intermediate Switch Boards (ISBs) for switch-to-switch communication or as Node Switch Boards (NSBs) for server-to-switch communication

- 1-Link or 2-Link Switch Network Interface cards
  - IBM @server p5 575 servers must have one 2-Link SNI per server
  - IBM @server p5 590 must have either two or four 1-Link SNIs per server
  - IBM @server p5 595 must have either two, four, six, or eight 1-Link SNIs per server
- CSM Management Server
  - One Management Server is required and it must be configured as the DHCP server
  - High Performance Switch Network Manager (HPSNM) must be installed on the Management Server
  - Cluster-Ready Hardware Server (CRHS) software must be installed on the Management Server
  - The Management Server must be connected to the Ethernet cluster service network
  - Refer to "CSM Management Server" on page 55 for additional information about the CSM Management Server
- Hardware Management Console (HMC)
  - One HMC must be designated as the Error Log Analysis (ELA) Master HMC for error log analysis
  - All HMCs must be connected to the Ethernet cluster service network
  - Refer to "Hardware Management Console" on page 58 for additional information on server support and HMC configuration

  Note: The DHCP function must be disabled on the HMC.
- Servers
  - Up to 128 servers per HPS cluster
    - A maximum of 128 of the 128 servers may be of the type p5-575
    - A maximum of 16 of the 128 servers may be of the type p5-590 or p5-595
    - For the 128 server limit, each p5-590 or p5-595 server counts the same as one p5-575 server
      - For example, a maximum cluster with 8 p5-595 servers would be limited to 120 p5-575 servers
  - Standard configurations limit the cluster to a maximum of:
    - 128 operating system images per cluster
      - No more than 16 of the 128 operating system images may be assigned to p5-590 or p5-595 servers
    - Two networks per cluster
      - 128 links per network
      - 256 links per system

    Note: IBM pSeries POWER4™ and POWER4+™ servers cannot be mixed into a cluster with IBM @server p5 servers.
- Switch cables
  - Server-to-switch cable options:
    - Copper: 0.5 m, 1.2 m, 3 m, and 10 m
    - Fiber optic: 3.5 m, 5 m, 10 m, 20 m, 30 m, and 40 m
  - Switch-to-switch cable options:
    - Copper cable: 3 m and 10 m
    - Fiber optic cables: 3.5 m, 5 m, 10 m, 20 m, 30 m, and 40 m
- Cluster service network cables
  - 6 m Ethernet (RJ-45 connectors)
  - 15 m Ethernet (RJ-45 connectors)

    Note: The cluster service network provides administrative LAN communication between the Management Server and all HMCs and frames in the cluster.

Note: If your switch network requires multiple HMCs, dedicated 19 inch frames for HMCs and Ethernet components may simplify installation and maintenance tasks.

HPS software overview

Required software components for systems configured with IBM @server p5 servers:

- Server operating system software: Either AIX 5L™ for POWER™ Version 5.3 or AIX 5L for POWER Version 5.2
- The required AIX support code for High Performance Switch and the associated Switch Network Interfaces including CSS Version 1.2.0.0 (for AIX 5.2) or CSS Version 1.1.3.0 (for AIX 5.2)

  Note: For a complete fileset listing and for information on network tuning, refer to *Switch Network Interface for eServer pSeries High Performance Switch Guide and Reference*, SC23-4869 and to the next level of support.
- IBM Cluster Systems Management for AIX 5L (CSM) Version 1.4.1
- High Performance Switch Network Manager (HPSNM) -- Switch management software (resides on the CSM Management Server in clusters configured with IBM @server p5 servers)
- IBM Web-based System Manager GUI
- Service Focal Point (SFP) -- Problem management software (resides on HMC)
- Service Agent -- Service Gateway function between IBM and customer
- Inventory Scout -- Vital Product Data and Microcode Management software (resides on HMC)

Additional required AIX 5.3 filesets:

- Reliable Scalable Cluster Technology (RSCT) -- Components include:
  – HATS
  – HAGS
  – configRM
  – IBM Virtual Shared Disk
  – Low-level communications API (LAPI)

  Notes:
  1. AIX 5.3 requires RSCT Version 2.4.2.0
  2. AIX 5.2 requires RSCT Version 2.3.6
  3. The `rsct.core.*` files (of RSCT) are required for HMC-to-LPAR communication.

Recommended software packages:

- General Parallel File System (GPFS)
- LoadLeveler® (LL)
- Parallel Environment (PE), includes the Message Passing Interface (MPI)

RAS overview

Reliability, Availability, and Serviceability (RAS) improvements built into the HPS create a switch network that:

- Does not have single points of failure
- Does not require immediate repair actions

The cluster must be configured for high availability to receive the full benefit of RAS improvements. High availability cluster configurations require one or more of the following optional software packages:

- Parallel Environment (PE)
- LoadLeveler
- General Parallel File System (GPFS)

Table 3 summarizes HPS RAS features:

Table 3. HPS RAS improvements

Failure	System effect	Repair mode
Service processor	Fail over to redundant service processors; fault tolerated	Concurrent with N+1 fail over
Switch Port Connection card	Alternate path recovery	Hot Plug repair; node still in network
Cooling fan	Fault tolerated	Concurrent
Power unit	Fault tolerated	Concurrent
Switch chip	Fault tolerated; alternate paths	Deferred
Switch Network Interface	Alternate path recovery	Deferred

Chapter 2. Cluster and switch network software

Attention: The information in this document is specific to configurations using IBM @server p5 servers. For information about software requirements for **previous** configurations using IBM @server pSeries servers, refer to @server *Cluster 1600 pSeries High Performance Switch Planning, Installation, and Service* (GA22-7951).

Cluster 1600 systems configured with the HPS and IBM @server p5 servers have required and optional software installations for cluster or switch network control. The required software packages include:

- "AIX"
- "IBM Cluster Systems Management for AIX 5.3 (CSM)" on page 16
- "High Performance Switch Network Manager (HPSNM)" on page 17
- "IBM Web-based System Manager GUI" on page 18
- Cluster-Ready Hardware Server
- "Diagnostic software" on page 19 including:
  - Service Focal Point (SFP)
  - Service Agent
  - Inventory Scout

In addition to the required software, several user software packages may be optionally installed. Although they are not required, these packages provide assistance for process and cluster management. "Optional software" on page 20 provides basic information on these components to help you determine how they would fit into your system administration strategy. For detailed information on these software packages, please refer to the documentation provided with each package. These packages include:

- General Parallel File System (GPFS)
- LoadLeveler
- Parallel Environment (PE) and MPI for PE

Required software

AIX

AIX 5L for POWER Version 5.2 or later is required on all servers used in a Cluster 1600 configured with the HPS. Some filesets included with this AIX package must be installed while other filesets may be optionally installed. For detailed information about AIX 5.3 or AIX 5.2, the filesets included in the package, and the installation or administration of AIX 5.3 or AIX 5.2, please refer to the AIX documentation provided with the software.

Required AIX filesets:

CSS -- AIX 5.3 requires CSS 1.2.0.0 while AIX 5.2 requires CSS 1.1.3.0. These versions of CSS provide SNI and HPS support code required filesets. CSS components provide IP Sockets and support for message passing Application Programming Interfaces (APIs) such as MPI and the LAPI components of RSCT. In addition to the required filesets, some AIX components that are included in the base install, have separate configuration requirements.

For example, **Technical Large Page Support** provides buffer space for send and receive packets and device drivers Because of that, TLP Support must be configured on each LPAR. The Large Page memory allocation for each LPAR is linked to the number of SNIs in the system and it is approximately equal to the Large Page requirement for drivers plus the Large Page requirement for receive buffers plus the Large Page requirement for send buffers.

Note: For a complete listing of the required AIX filesets and for information on network tuning and Technical Large Page Support configuration, refer to *Switch Network Interface for eServer pSeries High Performance Switch Guide and Reference*, SC23-4869

Additional required AIX 5.3 filesets:

Reliable Scalable Cluster Technology (RSCT) -- Provides information to other applications on available system resources and switch network topology. Components include:

- HATS (Group Services)
- HAGS (Group Services)
- configRM
- IBM Virtual Shared Disk
- Network Table (NTBL) API
- Low-level communications API (LAPI)

Notes:

1. AIX 5.3 requires RSCT Version 2.4.2.0
2. AIX 5.2 requires RSCT Version 2.3.6
3. The `rsct.core.*` files (of RSCT) are required for HMC-to-LPAR communication.

IBM Cluster Systems Management for AIX 5.3 (CSM)

Cluster System Management (CSM) Version 1.4.1 is packaged with current versions of AIX. CSM provides advanced clustering infrastructure functions and a robust, single point of control for the cluster. CSM is required for clusters configured with IBM @server p5 servers.

Notes:

1. Each server requires its own CSM license.
2. In addition to CSM, AIX 5L for POWER Version 5.2 or later and RSCT Version 2.3.6 or later must be installed on the CSM Management Server

   Notes:

   a. AIX 5.3 requires RSCT Version 2.4.2.0
   b. AIX 5.2 requires RSCT Version 2.3.6
   c. The `rsct.core.*` files (of RSCT) are required for HMC-to-LPAR communication.
3. For the latest software information and requirements refer to the CSM ″Read This First″ document.

CSM capabilities include:

Central Point of Operation

The CSM Management Server provides a central control point for cluster administration.

- The Management Server can be a separate server, workstation, or a server LPAR.
- For larger, multiple server clusters, a standalone workstation should be set up as the Management Server.

Manage and monitor cluster membership

Nodes can be added to and deleted from the cluster, cluster membership can be queried, and node attributes can be set and displayed.

Server installation

CSM may be installed as part of the full AIX install or individually as an option on servers that previously had the appropriate level of AIX installed.

Hardware control

Full support for power on, power off, reset and network boot is provided for HMC-connected Cluster 1600 servers. Automated collection of installation adapter MAC addresses and network boot are also supported.

Distributed remote command execution

CSM provides a performance-enhanced distributed shell. CSM also includes a new Web-based interface for dsh. The distributed shell can be configured to use either the standard remote shell (rsh) or the secure shell (ssh) as the underlying remote execution facility.

Configuration file management
: CSM provides automated propagation of configuration files and changes to those files across the cluster. This capability is built upon the widely used rdist open source software package.

Node groups
: The ability to reference a group of cluster nodes by an assigned name provides flexibility in targeting cluster management operations to subsets of nodes. Two kinds of node groups are provided:
  - Static node groups that contain a list of node names
  - Dynamic node groups that contain a description of node attributes

  Note: In a node group, a node is the equivalent of a server or LPAR.

Software diagnostic probe infrastructure
: Probes are short, single-purpose scripts which diagnose the health of a specific portion of a software component. The probe infrastructure allows a collection of probes to be linked in sequence-dependent order. The collection can then be issued by the administrator in response to problem symptoms to diagnose the overall software health of one or more components and to help determine the underlying cause of a system problem.

Distributed Monitoring
: The Remote Monitor and Control (RMC) component of AIX monitors events and conditions across a single system. RMC also provides for the automated invocation of programmed responses in the event of the occurrence of specific events and conditions. For AIX 5.3 RMC enhancement support distributed monitoring so that an event occurring on one node (server or LPAR) can be detected and responded to on a different node (such as the Management Server). A Web-based interface to RMC provides a highly usable way for system administrators to utilize this function.

Logging
: CSM provides an API for logging events on cluster servers or LPARs (nodes).

Security management and setup
: Cluster Ready AIX provides a complete set of cluster security functions. In addition, CSM on AIX provides automated configuration of remote shell (rsh) across the cluster nodes.

SMIT interface
: AIX 5.3 provides SMIT panels for hardware control and some cluster installation functions.

IBM Web-based System Manager interface
: Distributed event monitoring and dsh functions have Web-based interfaces.

Event forwarding to SNMP manager
: Event forwarding from the AIX Event Response Resource Manager component (built upon RMC) allows either predefined conditions or user-defined conditions to generate an SNMP event trap containing text information.

Scaling
: CSM on AIX supports scaling to up to 128 servers or LPARs in the clusters.

  Note: CSM scaling limits do not correspond directly to HPS scaling limits

High Performance Switch Network Manager (HPSNM)

Note: Detailed information on this switch network control software is available in Appendix E, “High Performance Switch Network Manager (HPSNM),” on page 465.

High Performance Switch Network Manager (HPSNM) is required for network operation in clusters configured with IBM @server p5 servers. In these clusters, HPSNM must be installed on the Management Server. Even though HPSNM operates from the Management Server, some network error logging and error analysis functions take place on the HMC. However, these error logging functions are part of the HMC code and you do not need to take any action for their configuration.

With HPSNM, the switch network does not require specific commands to start or stop switch operations or bring servers partitions on and off the switch. Instead, HPSNM dynamically determines network topology and initializes active switch components. When new components are added or removed, HPSNM again manages this with little or no user intervention.

Note: During installation, you will have to provide basic topology information. The system requires this information to determine the correlation between the detected network and the expected network.

With the HPS, all servers or server logical partitions (LPARs) act as peers on the switch. In contrast to previous SP switch types, the cluster does not have a ″switch primary″ node. Instead of a primary node, the HPS network uses the cluster service network and interfaces provided by the HPSNM software to configure, initialize, control, and monitor the switch network.

HPSNM functions

HPSNM provides the following functions from the Management Server:

Configuration functions
HPSNM dynamically sets up the internals of the network and defines its physical endpoints. This software also provides miswire detection, helps balance network bandwidth, offers limited capabilities to help plan network upgrades, and supplies service actions for non-operational components.

Initialization functions
HPSNM initialization functions allow you to set the operational parameters of the network. Initialization runs automatically once the network configuration is known. During initialization, HPSNM communicates with each active network component (switch and SNI), sets up their operational parameters, delivers route information to the endpoints, and signals to each server OS the availability of message passing over the network.

Control functions
HPSNM provides control and monitoring capabilities through the IBM Web-based System Manager Graphical User Interface (GUI) for function like:
- Power controls
- System status
- Diagnostics
- Network topology services
- Switch hardware control

Monitoring functions
HPSNM monitoring functions allow the software to detect, recover, and report error conditions in the network. When errors are detected, HPSNM determines the severity of the error, takes the appropriate action to recover or disable failing component, and creates serviceable events when appropriate. In most network configurations, these errors will not result in network outages.

Cluster-Ready Hardware Server

Cluster-Ready Hardware Server (CRHS) software is part of the CSM software installed on the Management Server. This software allows you to use the Management Server for management tasks and also as a console to interact with all of the HMCs within the cluster. Refer to “Cluster-Ready Hardware Server concepts” on page 57 for additional details.

IBM Web-based System Manager GUI

IBM Web-based System Manager GUI must be installed on the CSM Management Server and provides an interface for the High Performance Switch Network Manager (HPSNM) software. The IBM Web-based System Manager GUI provides access for the following HPSNM functions:

- View switch, adapter, and link information
- Power switch boards on and off
- Perform diagnostic functions
- View power environment information
- View software trace files (event logs)

The IBM Web-based System Manager GUI provides a complete set of web-based interfaces. These web-based interfaces enable administration of single or multiple AIX servers and AIX clusters from any client platform, including a browser on the administrator's home PC. The System Manager also provides easy access for user level AIX system commands. Security for the interface is based on public key cryptography and the SSL (Secure Socket Layer) protocol.

Note: If you do not use the IBM Web-based System Manager GUI interface, HPSNM may be operated from a command line interface on the Management Server. However, you will only be able to access a limited set of network commands.

Diagnostic software

Three system diagnostic tools are preinstalled on the HMC and are required for Cluster 1600 systems configured with the HPS. These tools are:

- "Service Focal Point (SFP)"
  - Problem management software
- "Service Agent"
  - Service Gateway function between IBM and the customer
- "Inventory Scout" on page 20
  - Vital Product Data and Microcode Management software

Note: For detailed information on the installation and use of these diagnostic tools, refer to the documentation provided with each server.

Service Focal Point (SFP)

In a partitioned environment, each partition runs independently and is not aware of other partitions on the system. If there is a problem with a shared resource such as a managed system power supply, all active partitions will report the same error. Service Focal Point recognizes that these errors repeat and filters them into one serviceable event for the service representative to review.

Service Focal Point must be configured from the HMC. From the SFP interface, you can examine the error log history and check for components requiring service. With Service Agent installed on the HMC, serviceable events captured by SFP will generate a maintenance request that is automatically sent to either:

- IBM by configuring the Call Home function
- Your own service group by configuring the Customer Notify function

Note: For a listing of error codes returned by Service Focal Point, refer to Appendix A, "FRU identification codes," on page 239.

Service Agent

Service Agent (also known as Electronic Service Agent™) is installed on the HMC and monitors the system for hardware errors. On Cluster 1600 systems managed by the HMC, the primary path for system hardware errors detection and analysis consists of the diagnostics function provided by AIX, the service processor, and Service Focal Point. Service Agent provides the transport facility to IBM.

Service Agent can execute several tasks, including:

- Automatic problem analysis

- Problem-definable threshold levels for error reporting
- Automatic problem reporting
- Automatic customer notification
- Visualize hardware error logs

Note: Service Agent reduces downtime in the event of a system component failure by giving the service provider the ability to view the error report and, if needed, order replacement parts prior to arriving on site.

Inventory Scout

Inventory Scout is a set of diagnostic tools that perform the following two functions:

- **Microcode Discovery Service:** Generates a real-time comparison report showing subsystems that may need to be upgraded.
- **VPD Capture Service:** Transmits the vital product data (VPD) information for your server to IBM.

With Service Agent configured on the HMC, these files generated by these services are automatically sent to IBM. You can optionally save files on DOS-formatted diskettes on the HMC diskette drive.

Optional software

The programs listed in this section may be optionally installed. For detailed information on these programs, refer to the documentation provided with each software package.

GPFS GPFS is a scalable cluster file system running as a client of IBM Virtual Shared Disk. This software provides high-speed, parallel file access from any node with the GPFS file system mounted. GPFS also provides fault-tolerance including automatic recovery from disk and node failures.

Note: GPFS Version 2.3.0 or later provides compatibility with the High Performance Switch and IBM eserver p5 servers.

LoadLeveler

LoadLeveler is a serial and parallel job-management subsystem. LoadLeveler allocates resources, schedules jobs, and initiates them using Parallel Environment (PE) and its associated MPI software. PE and MPI get the system information they need from the LAPI ″User Space″ protocol. For example, when submitting jobs to LoadLeveler:

1. The user requests resources to run a certain number of tasks and defines the number of windows per task.
2. LoadLeveler uses the Network Table API to get information from each server and network interface about availability and then matches job requests against available resources.
3. When the resources have been allocated to a job, LoadLeveler creates a set of Network Tables for each task and loads those Network Tables onto the servers which will run the job.
4. As the jobs run, LoadLeveler balances the communication load across the available network interfaces on a server.

Note: LoadLeveler Version 3.3.0 or later provides compatibility with the High Performance Switch and IBM eserver p5 servers.

Parallel Environment (PE)

PE calls LoadLeveler for resource assignment information, encodes that into environment variables, starts the user’s executable on the nodes assigned (as tasks of a parallel job), and passes the environment variables to those tasks via any TCP/IP interface. At the users’ task, the PE interface routine decodes the environment variables and uses that information to initialize the MPI library and its LAPI transport interface. In addition, you can provide failover and recovery for link problems by routing MPI messages over multiple links.

Note: PE Version 3.3.0 or later provides compatibility with the High Performance Switch and IBM eserver p5 servers.

Message Passing Interface (MPI) for PE
MPI optimizes message traffic to boost performance of the entire system. With message passing, each task operates exclusively in a private environment, but must cooperate with other tasks to exchange messages. MPI coordinates the data flow between servers. This ensures that correct values for the passed data are available when required by each task and also provides a high level of performance for user message passing.

Parallel Engineering and Scientific Subroutine Library (Parallel ESSL)
Parallel ESSL is a scalable mathematical subroutine library that supports parallel processing applications on clustered servers configured with the High Performance Switch. Parallel ESSL supports the Single Program Multiple Data (SPMD) programming model using the Message Passing Interface (MPI) library

Chapter 3. HPS hardware planning

The HPS may be used with M/T 9118-575, M/T 9119-590, and M/T 9119-595 servers as part of a Cluster 1600 scalable system (refer to Figure 7 on page 24). When the cluster is configured with the HPS and IBM @server p5 servers, other switch and server types are not allowed in that cluster. The Cluster 1600 may include:

- High Performance Switches mounted in:
  - Server frames
    - Must be configured as Node Switch Boards (NSBs)
    - Requires the addition of EMC skirts to existing frames
  - Switch-only frames
    - May be configured as either Node Switch Boards or Intermediate Switch Boards (ISBs)
    - Switch-only frames with three or more switches may require **FC 6234** frame extenders for cable management

      Note: If a switch-only frame has three or more switches *and* less than 32 copper switch cables, the FC 6234 frame extender may be deselected on the configurator. This option is only available to minimize the frame footprint when the majority of switch cables in that frame are fiber optic switch cables.
- IBM @server p5 575 servers (M/T 9118-575)
- IBM @server p5 590 servers (M/T 9119-590)
- IBM @server p5 595 servers (M/T 9119-595)
- A CSM Management Server
- One or more Hardware Management Consoles (HMC)

Note: To accommodate cable installation and to meet radiated EMC limits, clustered servers configured with the HPS **must** be installed in a raised floor facility.

Cluster 1600 systems that are configured with the HPS and IBM @server p5 servers require the following components:

- Optical or copper cable Switch Port Connection cards (risers)
  - Cable requirements depend on the server type
- Blank Switch Port Connection cards are required for any unused switch slot
- Port covers are required for any unused port on copper cable Switch Port Connection cards
  - Port covers are required for EMC compliance
- 1-Link or 2-Link Switch Network Interface (SNI) cards
  - SNI requirements depend on the server type
  - 1-Link SNIs must be ordered and installed in pairs

  Note: The customer must supply any additional Ethernet hubs, routers, or switches that may be required for the cluster service network. Refer to your server and HMC documentation for additional details.

All Cluster 1600 systems configured with the HPS and IBM @server p5 servers require Cluster System Management (CSM) software. CSM provides:

- A single point of control and improved scalability for e-business applications
- Cluster-Ready Hardware Server (CRHS) software for single point access to all HMCs from the Management Server

Depending on server type, a Cluster 1600 system configured with the HPS can contain up to 128 servers with a maximum of 256 links (larger configurations are available by special order). For details on quantities for the different node types, see "Cluster 1600 scaling limits" on page 25.

Note: The CSM Management Server and the Hardware Management Consoles are not counted as system servers for the cluster limit.

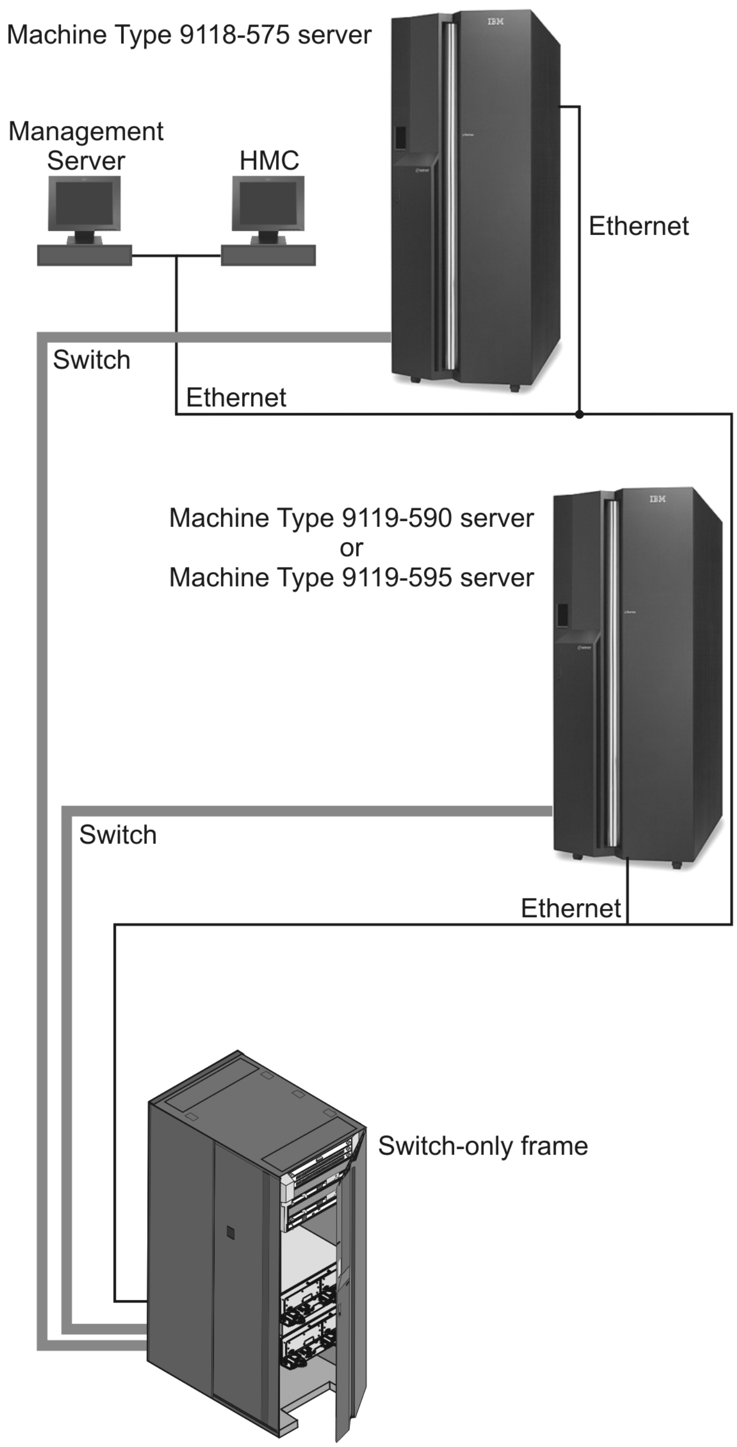


Figure 7. Conceptual Cluster 1600 system

Cluster 1600 scaling limits

When a Cluster 1600 is configured with the HPS and IBM @server p5 servers, the scaling rules state that:

- Only p5-575, p5-590, and p5-595 servers are allowed in this cluster configuration
- The cluster can contain up to 128 operating system images
- The cluster can have up to 128 links per network providing a maximum of 256 links in a two network configuration
  - Larger configurations are available through special order

  Note: When you are planning network connection endpoints, you **must** follow the link assignment procedures described in Appendix C, "HPS network configuration," on page 305 and Appendix D, "Cabling the HPS," on page 337. Those procedures follow a set of rules that provide optimum distribution of links across the system. Failure to adhere to those rules will result in network errors and performance degradation.
- The total number of links allowed in the cluster depends on the mix of servers in the configuration
  - Up to 128 p5-575 servers are allowed and each of these servers can have one, 2-Link SNI installed
  - Up to 16 p5-590 or p5-595 servers are allowed, and each of these servers can have up to eight, 1-Link SNIs installed (SNIs must be installed in pairs)
- All servers must run in the LPAR mode
- Other switch types and server types cannot be mixed into the configuration
- Additional CSM software limits may apply

CSM scaling rules for Cluster 1600 with HPS

This section list the scaling rules for Cluster 1600 systems configured with the HPS and using CSM for cluster control. In this configuration, the cluster may consist of 2 to 128 AIX operating system images. These operating system images (or logical nodes) can be:

- A M/T 9119-590 server (p5-590) running as a full-system partition (in LPAR mode)
- A Logical Partition (LPAR) of a p5-590 server
- A M/T 9119-595 server (p5-590) running as a full-system partition (in LPAR mode)
- A Logical Partition (LPAR) of a p5-595 server
- A M/T 9118-575 server (p5-575) running as a full-system partition (in LPAR mode)

M/T 9119-590 and M/T 9119-595 maximum limits with CSM

Table 4 shows the maximum number of p5-590 or p5-595 servers that may be installed in a cluster using CSM for cluster control. Use this table in conjunction with the scaling rules to determine valid configurations.

Table 4. Maximum limits for Cluster 1600 using 9119 servers with CSM

Configuration	HPS cluster
M/T 9119-590 or M/T 9119-595 servers per Cluster 1600	16
Switched LPARs per M/T 9119-590 or M/T 9119-595 server	2 per M/T 9119-590 server 4 per M/T 9119-595 server

M/T 9118-575 maximum limits with CSM

Table 5 on page 26 shows the maximum number of M/T 9118-575 servers that may be installed in a cluster using CSM for cluster control. Use this table in conjunction with the scaling rules to determine valid configurations.

Table 5. Maximum limits for Cluster 1600 using 9118 servers with CSM

	HPS cluster
M/T 9118-575 servers per Cluster 1600	128
LPARs per M/T 9118-575 server	1

HPS system feature codes

Feature codes for the High Performance Switch system can be placed in the following categories:

"Switch related feature codes"
These feature codes specify the switch configuration and the network components attached to the switch

"Switch-only frame feature codes"
These feature codes specify the frame configuration and the location of components within the frame

"Server related feature codes" on page 28
These feature codes specify the switch related components that you will install in the server

Switch related feature codes

The first two feature codes listed in Table 6 specify the switch configuration as either an ISB or an NSB. The additional feature codes listed in that table order components that are either installed in or attached to the switch.

Table 6. Switch related feature codes

Feature codes	**Description**
FC 0212	Rack content specify code to identify the HPS
FC 9049	High Performance Switch ISB indicator
FC 9047	High Performance Switch NSB indicator
FC 7963	Switch cable pair, 30 m (fiber optic)
FC 7962	Switch cable pair, 10 m (fiber optic)
FC 7923	Switch cable pair, 3.5 m (fiber optic)
FC 6436	Switch Port Connection card, optical
FC 6435	Switch Port Connection card, blank
FC 6433	Switch Port Connection card, copper
FC 3257	Switch cable pair, 40 m (fiber optic)
FC 3256	Switch cable pair, 20 m (fiber optic)
FC 3167	Switch cable, 10 m (copper)
FC 3166	Switch cable, 3 m (copper)
FC 3161	Switch cable, 1.2 m (copper)

Switch-only frame feature codes

Use the feature codes listed in Table 7 on page 27 to order frame components and to specify the locations of components in the frame.

Table 7. Switch-only frame feature codes

Feature codes	Description
FC 0212	Rack content specify code to identify the HPS
FC 3755	Service ladder
FC 3756	Service tool kit, HPS
FC 4644	Migrated switch feature for M/T 7045-SW4
FC 5792	Expansion rack, powered
FC 6186	Bulk Power Regulator
FC 6125	Power cables, 4X, 01U (for **FC 8691** expansion frame)
FC 6126	Power cables, 4X, 05U (for **FC 8691** expansion frame)
FC 6127	Power cables, 4X, 09U (for **FC 8691** expansion frame)
FC 6128	Power cables, 4X, 013U (for **FC 8691** expansion frame)
FC 6129	Power cables, 4X, 019U (for **FC 8691** expansion frame)
FC 6200	Front mounted Integrated Battery Feature (IBF) option **Notes:** 1. This feature code is not required. 2. **FC 6200** is used in place of **FC 6201** on switch-only frames. 3. **FC 6200** may be connected to either a primary or backup BPR on switch-only frames. 4. If you order **FC 6200**, you must also order IBF to BPR connection cables for each IBF.
FC 6234	Frame extender **Note:** If a **switch-only** frame has three or more switches *and* less than 32 copper switch cables, the **FC 6234** frame extender may be deselected on the configurator.
FC 6240	IBF to BPR connection cable
FC 6241	IBF to BPR connection cable
FC 6242	IBF to BPR connection cable
FC 6251	Slimline doors
FC 6253	Slimline doors, for **FC 8691** Expansion rack
FC 6850	Shipping weight reduction feature
FC 6855	Weight distribution plate
FC 7801	Ethernet cable, cluster service network (6 m)
FC 7802	Ethernet cable, cluster service network (15 m)
FC 7803	Bulk power controller assembly
FC 7837	Bulk power distribution assembly
FC 7842	Power cables, 4X, 039U (for **FC 8691** expansion frame)
FC 7843	Power cable group, (03U or 01U right)
FC 7844	Power cable group, (01U or 01U left)
FC 7845	Power cable group, (07U or 05U right)
FC 7846	Power cable group, (05U or 05U left)
FC 7849	Power cables, 4X, 023U (for **FC 8691** expansion frame)
FC 7850	Power cables, 4X, 027U (for **FC 8691** expansion frame)
FC 7851	Power cables, 4X, 031U (for **FC 8691** expansion frame)

Table 7. Switch-only frame feature codes (continued)

Feature codes	Description
FC 7852	Power cables, 4X, 035U (for **FC 8691** expansion frame)
FC 7853	Power cables, 4X, 01U
FC 7854	Power cables, 4X, 05U
FC 7855	Power cables, 4X, 09U
FC 7856	Power cables, 4X, 13U
FC 7857	Power cables, 4X, 19U
FC 7858	Power cables, 4X, 23U
FC 7859	Power cables, 4X, 27U
FC 7860	Power cables, 4X, 31U
FC 7922	Switch cable, copper (0.5 m)
FC 7923	Switch cable, fiber optic (3.5 m)
FC 7937	Bolt-down kit, low-raised floor
FC 7938	Bolt-down kit, high-raised floor
FC 7960	Compact handling option
FC 7962	Switch cable, fiber optic (10 m)
FC 7963	Switch cable, fiber optic (30 m)
FC 7964	Shipping depth reduction
FC 8677	Line cord, 8 AWG, no plug, 4.3 m (14 foot)
FC 8686	Line cord, 6 AWG, IEC309 100 Amp plug, 4.3 m (14 foot)
FC 8687	Line cord, 6 AWG, IEC309 100 Amp plug, 1.8 m (6 foot)
FC 8688	Line cord, 6 AWG Type W, IEC309 60 Amp plug, 4.3 m (14 foot)
FC 8689	Line cord, 6 AWG Type W, IEC309 60 Amp plug, 1.8 m (6 foot)
FC 8691	Expansion rack, 24″ 42U
FC 8694	Line cord, 6 AWG, no plug, 4.3 m (14 foot)
FC 8697	Line cord, 8 AWG, IEC309 30 Amp plug, 4.3 m (14 foot)
FC 8698	Line cord, 8 AWG, IEC309 30 Amp plug, 1.8 m (6 foot)
Note: For additional information on AC line cord options, refer to "Power cords, plugs, and receptacles" on page 284.	

Server related feature codes

The feature codes listed in Table 8 specify switch related components that must be installed in p5-575 servers (M/T 9118-575) connected to the switch network.

The feature codes listed in Table 9 on page 29 specify switch related components that must be installed in p5-590 and p5-595 servers (M/T 9119-590 and M/T 9119-595) connected to the switch network.

Table 8. p5-575 server related feature codes

Feature codes	Description
FC 0212	Feature number used to identify the HPS
FC 3161	Switch cable, copper 1.2 m (4 foot)
FC 3166	Switch cable, copper 3 m (10 foot)

Table 8. p5-575 server related feature codes (continued)

Feature codes	Description
FC 3167	Switch cable, copper 10 m (33 foot)
FC 3756	Service tool kit, HPS
FC 4644	Migrated drawer indicator, M/T 7045-SW4
FC 6245	EMC skirt and tailgate assembly for frames connected to the switch network
FC 7853	Power cables, 4X, 01U
FC 7854	Power cables, 4X, 05U
FC 7910	2-Link Switch Network Interface (copper)
FC 7922	Switch cable, copper, 0.5 m (1.7 foot)

Table 9. p5-590 and p5-595 server related feature codes

Feature codes	Description
FC 0212	Feature number used to identify the HPS
FC 3256	Switch cable, fiber optic 20 m (65.6 foot)
FC 3257	Switch cable, fiber optic 40 m (131.2 foot)
FC 3756	Service tool kit, HPS
FC 4644	Migrated drawer indicator, M/T 7045-SW4
FC 6243	EMC skirt and tailgate assembly for frames connected to the switch network
FC 7817	1-Link Switch Network Interface (fiber optic)
FC 7923	Switch cable, fiber optic, 3.5 m (11.5 foot)
FC 7962	Switch cable, fiber optic, 10 m (32.8 foot)
FC 7963	Switch cable, fiber optic, 30 m (98.4 foot)

Cluster 1600 installation requirements

Several hardware and software requirements must be met before you can place the Cluster 1600 system into service including:

- "System requirements for servers"
- "Physical requirements" on page 30
- "Software requirements for the HPS" on page 30
- "Switch interfaces and cabling" on page 33

System requirements for servers

If M/T 9118-575, M/T 9119-590, or M/T 9119-595 servers are used in your Cluster 1600 system and the system is going to be configured with the HPS, the servers require:

- Switch Network Interfaces must be installed in each server connected to the switch.
  - M/T 9118-575 (p5-575) servers require one **FC 7910** SNI
  - M/T 9119-590 (p5-590) servers require two or four **FC 7817** SNIs
    - **FC 7817** SNIs must be ordered and installed in pairs
  - M/T 9119-595 (p5-595) servers require two, four, six, or eight **FC 7817** SNIs
    - **FC 7817** SNIs must be ordered and installed in pairs
  - All external SNI links must have an IP address assigned when you configure the network

- Switch cables (for details, see "Switch interfaces and cabling" on page 33)
- Switch Port Connection cards (for details, see "Switch interfaces and cabling" on page 33)
- An Ethernet connection to the HMC and the Management Server
  – For additional information refer to "CSM Management Server" on page 55 and "Hardware Management Console" on page 58

Switch cable restrictions

Placement of the switch and servers is limited by the length of the required cables:

- Copper switch cables are available in 0.5 m, 1.2 m, and 3 m (for internal frame use) and 10 m (for frame-to-frame use) lengths. When planning frame locations, remember to add the cable length consumed making vertical runs to the cable length consumed making horizontal runs between frames. The length of 10 m (33 foot) cable consumed making vertical runs between upper slots of adjacent frames is an important frame placement planning consideration.
- Fiber optic switch cables are available in 3.5 m, 10 m, 20 m, 30 m, and 40 m lengths.

Physical requirements

Before you receive the components for your HPS Cluster 1600 system, you need to determine the route you will use to move the components from the delivery location to the installation site. You must assess the potential delivery route for the following:

- Make certain that all doorways, elevators, and corridors have sufficient height and width clearance to allow movement from the loading dock to the installation site.
- Make certain that all elevators, ramps, and corridors have sufficient load ratings to allow movement without exceeding any weight limitations encountered along the route from the loading dock to the installation site.
- If any there are any turns, bends or obstructions in the route from the loading dock to the installation site, make certain that their is sufficient clearance to maneuver through or around those locations.
- If you determine that there may be, or if you are not certain that there are clearance issues related to moving the system from your loading dock to the installation site, please contact your IBM site planning, marketing, or sales representative.

Note: For a detailed description of site preparation tasks refer to *IBM @server p5 590/595 and 575, Including pSeries High Performance Switch, Solution Assurance Discussion Guide*, (SA04-010).

Refer to Appendix B, "Physical and environmental specifications," on page 281 for a complete list of physical requirements including:

- Additional installation considerations
- Environmental operating conditions
- Power requirements and electrical specifications
- Cooling requirements
- Frame size, weight, and floor load specifications
- Floor plan layouts with service clearances

Software requirements for the HPS

For detailed information on software requirements for the HPS, refer to Chapter 2, "Cluster and switch network software," on page 15.

Planning for switch network hardware

This section contains the following network hardware planning information:

- “Cluster service network”
- “Switch interfaces and cabling” on page 33
- “Switch network cable options” on page 35
- “SNI installation restrictions” on page 48

Cluster service network

Cluster service network overview:

- The cluster service network provides an Ethernet communication path for all system administration and system monitoring functions.
- All switch-only frames and any IBM @server p5 server frame connected to the switch network also requires a connection to the cluster service network.
- All HMCs and the Management Server must be connected to the cluster service network.
- The connection between each frame and the service network passes through the frame BPC
- Individual switches and servers are not directly connected to the service network.
- You may configure the cluster service network as a simple network or as a redundant network.
- Redundant service networks enhance system fault tolerance. If a fault does occur, service network failover is automatic and controlled by system code.
- Figure 8 on page 32 provides a high-level view of a simple cluster service network
  - Refer to Figure 18 on page 52 for a detailed view of a simple, non-redundant cluster service network
  - Refer to Figure 18 on page 52 for a detailed view of redundant service network

Depending on your cluster configuration, the cluster service network may also require additional Ethernet hubs, routers, switches, adapters, and cables. Any of these additional Ethernet components **must** be supplied by the customer. To simplify service, you may want to mount all cluster service network components in a standard 19 inch frame. Rack mounted HMCs are available for these frames but the frame **must** be supplied by the customer.

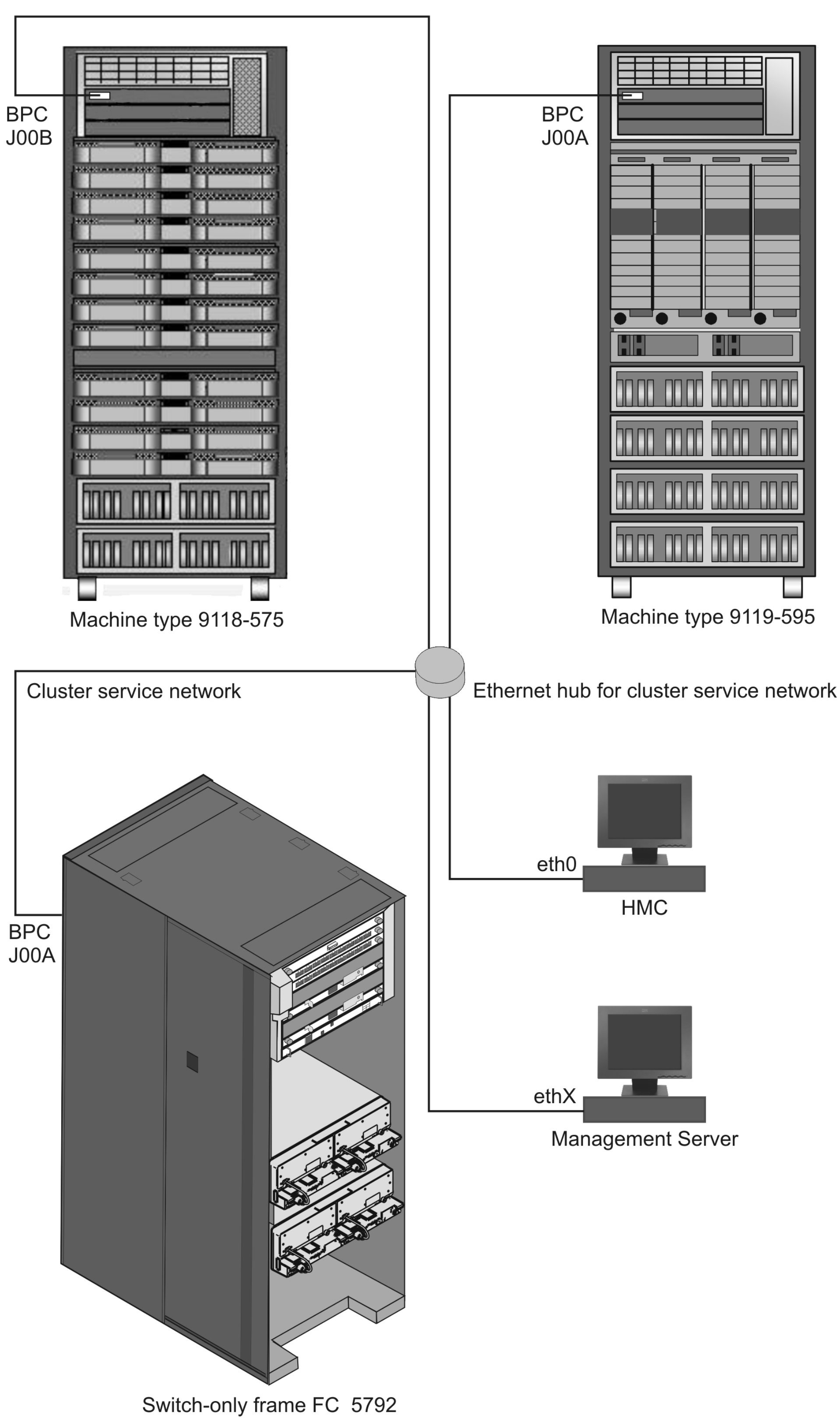


Figure 8. Overview of the cluster service network layout

Switch interfaces and cabling

There are two types of switch connections (interfaces):

Server-to-switch

Each server-to-switch connection requires three component types:

- Switch Network Interfaces on the server side of the connection
- Switch Port Connection (SPC) cards on the switch side of the interface
- Switch cables connecting the server side to the switch side of the interface

Switch-to-switch

Each switch-to-switch connection requires two component types:

- A paired set of Switch Port Connection (SPC) cards, one mounted in each switch using either:
  - Copper cable option
  - Fiber optic cable option
- Cables to connect the paired Switch Port Connection cards using either:
  - Two copper cable features
  - Two fiber optic cable features

Attention: When you are planning network connection endpoints, you **must** follow the link assignment procedures described in Appendix C, "HPS network configuration," on page 305 and Appendix D, "Cabling the HPS," on page 337. Those procedures follow a set of rules that provide optimum distribution of links across the system. Failure to adhere to those rules will result in network errors and performance degradation.

Server-to-switch interface

Switch Network Interface (SNI): If you plan to install the HPS in your Cluster 1600 system, you must install Switch Network Interfaces (SNIs) in each server connected to a switch. The following SNI options are available for IBM @server p5 servers:

- 1-Link Switch Network Interface (SNI) **FC 7817**
  - GX bus mounted card used in p5-590 and p5-595 servers
  - Configured for fiber optic switch cables
  - Each FC 7817 provides one link of a link pair
  - FC 7817 SNIs must be ordered and installed in pairs
  - Two or four FC 7817 SNIs can be installed in each p5-590 server
  - Two, four, six, or eight FC 7817 SNIs can be installed in each p5-595 server
- 2-Link Switch Network Interface (SNI) **FC 7910**
  - GX bus mounted card used in p5-575 servers
  - Configured for copper switch cables
  - Each FC 7910 provides one link pair
  - One FC 7910 can be installed in each p5-575 server
  - Configuration rules require installing these SNIs on alternating sides of the server to simplify cable management

Switch Network Interfaces have the following requirements:

1. Each SNI must be installed in a legitimate server or logical partition
2. The switch ports provided by the SPC cards must be assigned to specific ports on the SNIs (refer to Appendix C, "HPS network configuration," on page 305 and Appendix D, "Cabling the HPS," on page 337 for switch port assignment information)
3. For M/T 9118-575, each 2-Link SNI requires one GX bus slot on the server (one card per server)
4. For M/T 9119-590 or M/T 9119-595, each 1-Link SNI requires one GX bus slot on the server (cards must be installed in pairs and two, four, six, or eight cards may be installed in each server)
5. Switch cables to connect each SNI link to a valid SPC card
6. As part of the network configuration process, you must assign an IP address to all external SNI links

Switch Port Connection (SPC) cards: Each link pair on a server mounted SNI requires a corresponding Switch Port Connection (SPC) card mounted in the switch. Therefore each 1-Link SNI pair and each 2-Link SNI requires one SPC card.

Note: The requirement for an SNI to have a corresponding SPC card is given from an accounting viewpoint. The concept of one SNI being connected to one SPC card is only used to determine how many SPC cards are required for the entire system. In fact, the connections from one SNI (or SNI pair) will not be routed to one SPC card. When the SNIs are physically cabled, each cable will get connected to separate SPC card. Spreading the connections across multiple cards improves the RAS characteristics of the system.

The following requirements exist for server-to-switch connections:

- p5-575 servers require copper cable SPC cards in the switch (**FC 6433**)
- p5-590 and p5-595 servers require fiber optic cable SPC cards in the switch (**FC 6436**)
- If an SPC card is going to be used for server-to-switch communication, that switch must be configured as a Node Switch Board (NSB)
- For additional information on Switch Port Connection cards refer to Appendix C, “HPS network configuration,” on page 305

Cables: You must determine the total number of server-to-switch cables required for each configuration using the information in Appendix D, “Cabling the HPS,” on page 337 and “Server-to-switch cable connections” on page 385. The information in this section outlines the Feature Codes required for ordering your cables.

Depending on your switch network configuration, each SNI mounted in a p5-575 (M/T 9118-575) server requires one of the following options for copper switch cables for each port on the SNI:

- **FC 7922**: 0.5 m (1.6 foot) copper switch cable (internal frame applications)
- **FC 3161**: 1.2 m (3.9 foot) copper switch cable (internal frame applications)
- **FC 3166**: 3 m (7.2 foot) copper switch cable (internal frame applications)
- **FC 3167**: 10 m (32.8 foot) copper switch cable (frame-to-frame applications)

Each SNI mounted in a p5-590 (M/T 9119-590) or p5-595 (M/T 9119-595) server requires one of the following options for fiber optic switch cable pairs for each pair of ports on the SNI:

- **FC 7923**: 3.5 m (11.5 foot) fiber optic switch cable pair (internal frame applications)
- **FC 7962**: 10 m (32.8 foot) fiber optic switch cable pair (frame-to-frame applications)
- **FC 3256**: 20 m (65.6 foot) fiber optic switch cable pair (frame-to-frame applications)
- **FC 7963**: 30 m (98.4 foot) fiber optic switch cable pair (frame-to-frame applications)
- **FC 3257**: 40 m (131.2 foot) fiber optic switch cable pair (frame-to-frame applications)

Notes:

1. Fiber optic switch cable pairs consist of one transmit cable and one receive cable.
2. Each fiber optic switch cable feature code returns one pair of cables.

Switch-to-switch interface

Switch Port Connection (SPC) cards: Each connection between two High Performance Switches requires a pair of SPC cards with one SPC card mounted in each switch. For switch-to-switch connections, you have two options:

- Copper cable Switch Port Connection cards (**FC 6433**)
- Fiber optic Switch Port Connection cards (**FC 6436**)

The same Switch Port Connection cards are used for switch-to-switch communication on both Node Switch Boards (NSBs) and Intermediate Switch Boards (ISBs). However, when used in an NSB, specific switch slots are reserved for switch-to-switch connections. When two or more NSBs are used in a HPS network, all switch slots reserved for switch-to-switch connections must be populated with a SPC card. In addition, these SPC cards must be cabled using one of the cable configurations listed in "Switch-to-switch cable connections" on page 341. For additional information on switch-to-switch connections refer to Appendix C, "HPS network configuration," on page 305.

Cables: All Switch Port Connection cards used for switch-to-switch connections must be cabled using a valid cable configuration (refer to "Switch-to-switch cable connections" on page 341). The cable options for switch-to-switch connections are:

- Copper switch cables
  - **FC 7922**: 0.5 m (1.6 foot) copper switch cable (internal frame applications)
  - **FC 3161**: 1.2 m (3.9 foot) copper switch cable (internal frame applications)
  - **FC 3166**: 3 m (7.2 foot) copper switch cable (internal frame applications)
  - **FC 3167**: 10 m (32.8 foot) copper switch cable (frame-to-frame applications)
- Fiber optic switch cables
  - **FC 7923**: 3.5 m (11.5 foot) fiber optic switch cable pair (internal frame applications)
  - **FC 7962**: 10 m (32.8 ft) fiber optic switch cable pair (frame-to-frame applications)
  - **FC 3256**: 20 m (65.6 ft) fiber optic switch cable pair (frame-to-frame applications)
  - **FC 7963**: 30 m (98.4 ft) fiber optic switch cable pair (frame-to-frame applications)
  - **FC 3257**: 40 m (131.2 ft) fiber optic switch cable pair (frame-to-frame applications)

For additional information on switch-to-switch cables refer to Appendix D, "Cabling the HPS," on page 337 and "Switch-to-switch cable connections" on page 341.

Network service tools

The High Performance Switch service tool kit (**FC 3756**) contains diagnostic aids used during network service. After placing **FC 3756** on the order for the first switch, you may remove this feature code from additional M/T 7045-SW4 orders. This prevents multiple tool kits from shipping with your system. This tool kit includes:

- A diagnostic switch port connection card
  - Replaces the SPC card with an internal wrap and isolates switch problems to either the switch planar or the SPC card (riser)
- Copper cable wrap plug
  - Replaces copper switch cables at either the SPC card or the SNI to isolate problems to either the switch, the SNI port, or the cable
- Optical wrap cable
  - Replaces fiber optic switch cables at either the SPC card or the SNI to isolate problems to either the switch, the SNI port, or the cable
- A diagnostic copper switch cable
  - A 5 m cable used to test switch driver function

Note: Every HPS installation must have access to one service tool kit. Failure to have at least one kit available may result in delayed or prolonged maintenance times.

Switch network cable options

When you are making detailed plans for network connection endpoints, you **must** follow the link assignment procedures described in Appendix C, "HPS network configuration," on page 305 and Appendix D, "Cabling the HPS," on page 337. Those procedures follow a set of rules that provide optimum distribution of links across the system. Failure to adhere to those rules will result in network errors and performance degradation.

This section provides an introduction to the detailed planning information in the appendices. These introductions are presented as the following network cable options:

- "Switch-to-switch cable options for all network configurations" on page 36

- “Server-to-switch cable options for single network configurations” on page 40
- “Server-to-switch cable options for dual network configurations” on page 46

Note: *Server-to-switch* cable layouts are controlled by the number of networks in your configuration and the number of SNIs connected to NSBs on each network. These two variables determine the location of server-to-switch SPC (Switch Port Connection) cards on the NSBs. Because the SPC card locations change with the size and configuration of each network, you must make detailed calculations for each specific network.

Switch-to-switch cable options for all network configurations

All networks with two or more NSBs on each network must have SPC cards installed in all switch-to-switch slots on the NSBs. In addition, you must install switch-to-switch cables between the associated SPC cards. These cables and SPC cards are in addition to the number required for server-to-switch connectivity.

Table 10 provides a summary of switch cable and SPC cards required for switch-to-switch connections. In addition, the illustrations following the table provide a high level comparison of the cable configurations required for switch-to-switch cable configurations:

- Figure 9 on page 37for networks with up to six NSBs
- Figure 10 on page 38 for networks having eight NSBs
- Figure 11 on page 39 for dual network systems with eight NSBs per network

Table 10. Switch-to-switch hardware requirements

NSBs in network	Switch-to-switch cables (or cable pairs) required		Switch Port Connection cards required for switch-to-switch connections	
	Single network configuration	Dual network configuration	Single network configuration	Dual network configuration
One NSB	0	Not available	0	Not available
Two NSBs	16	0	16	0
Three NSBs	24	Not available	24	Not available
Four NSBs	64	32	64	32
Five NSBs	80	Not available	88	Not available
Six NSBs	96	48	96	48
Seven NSBs	112	Not available	120	Not available
Eight NSBs	128	128	128	128
Sixteen NSBs	Not available	256	Not available	256

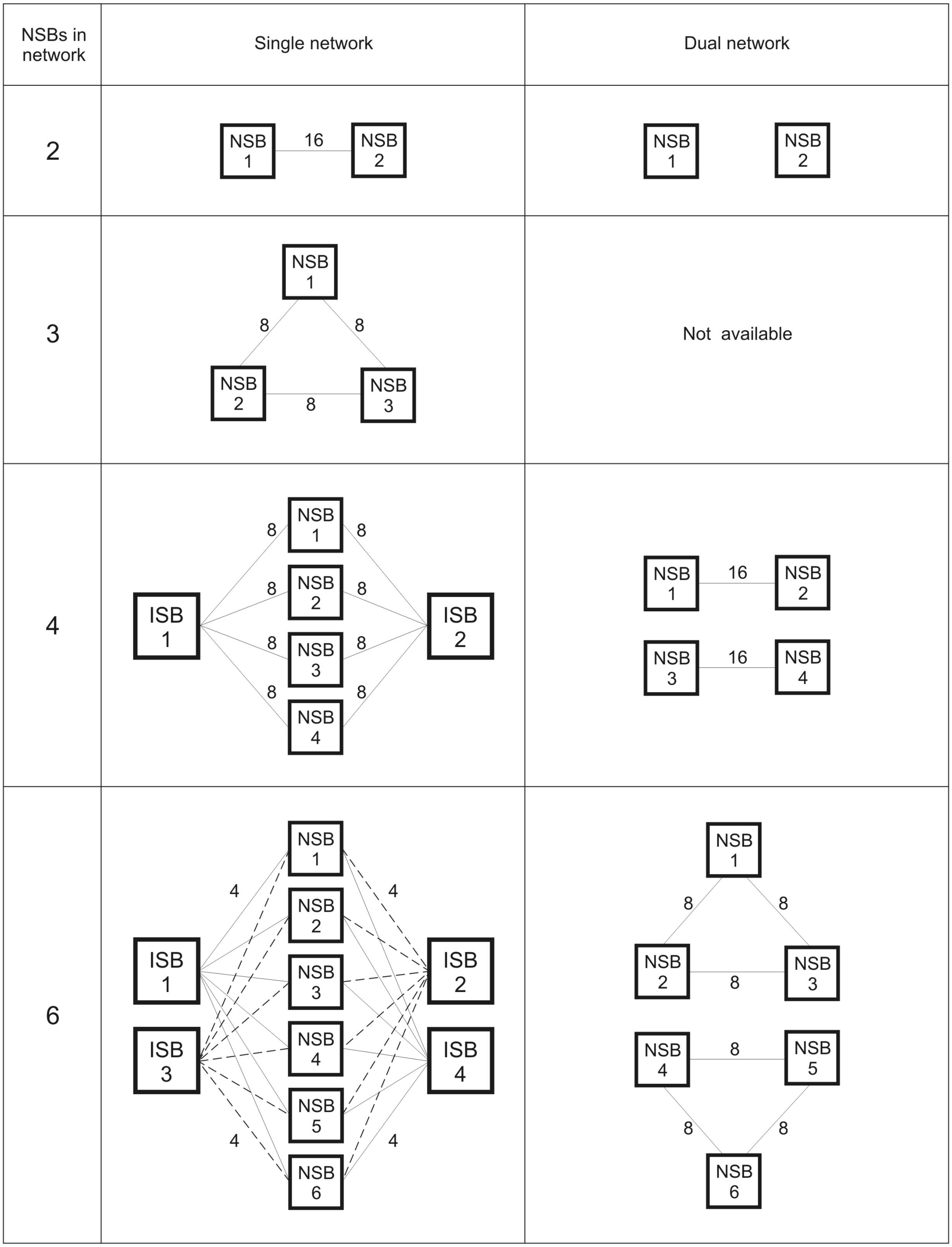


Figure 9. Switch cable paths for two, three, four, and six NSB networks. The numbered squares represent the switch boards and the lines represent the cable sets connecting them. The number above each line states the quantity of individual cables in each group (server-to-switch cables are not shown).

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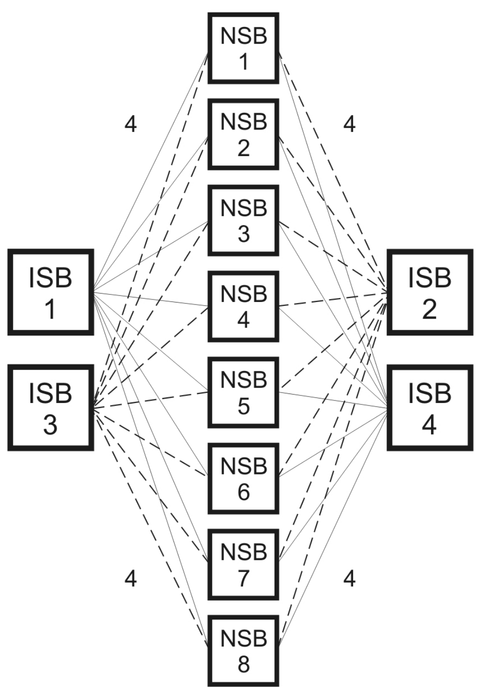
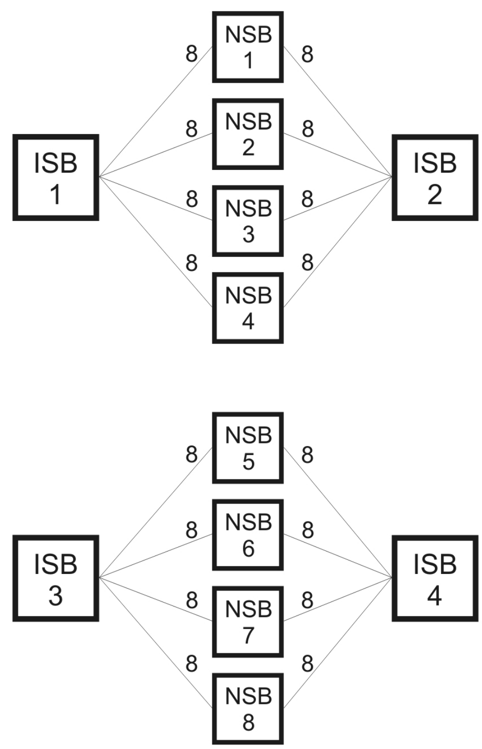
<tr><th>NSBs in network</th><th>Single network</th><th>Dual network</th></tr>
<tr><td>8</td><td>
</td><td>
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Figure 10. Switch cable paths for networks with eight NSBs and four ISBs

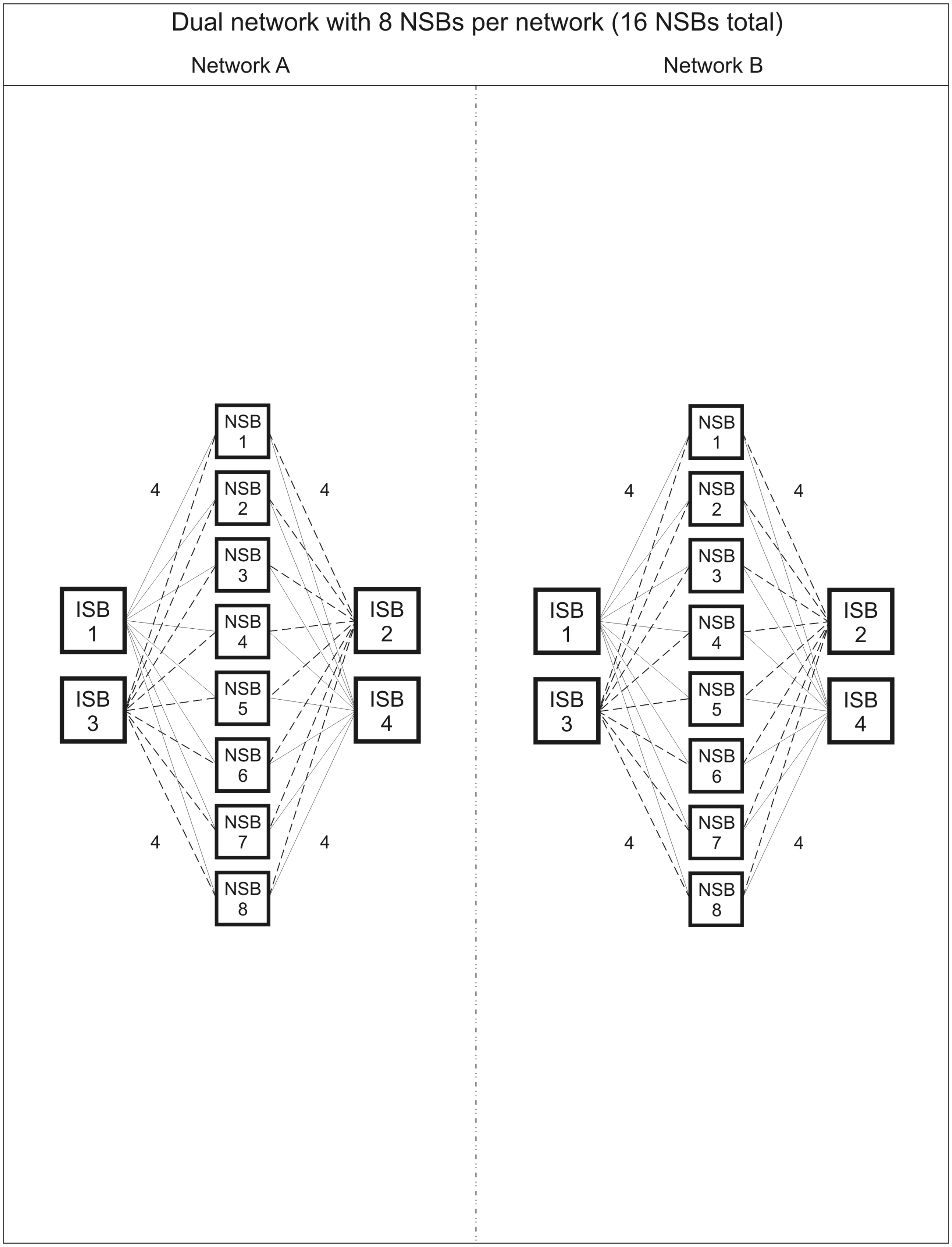


Figure 11. Switch cable paths for dual network system with eight NSBs and four ISBs per network

Server-to-switch cable options for single network configurations

There are two methods that you can use to cable a Cluster 1600 configured with a single HPS network:

Sequential switch cabling

Sequential switch cabling populates one switch at a time. Each switch must have all server-to-switch SPC card slots fully populated before the next switch is populated.

- Sequentially cabled switches are referred to as non-paired switches
- Refer to Figure 12 on page 41 and Figure 13 on page 43 for illustrations of these cable configurations
- Refer to Table 11 on page 42 and Table 12 on page 44 for the planning information used for each illustration
- The reference tables for non-paired switches are provided in "Systems with 1 NSB per network" on page 415

Note: A network that has been sequentially cabled, must be completely re-cabled for dual network configurations.

Alternating switch cabling

Alternating switch cabling populates two links on the first switch and then two links on the second switch. This cable installation pattern keeps alternating back and forth between the switches until each pair is fully populated.

- Switches with alternating cables are referred to as paired switches
- Refer to Figure 14 on page 45for an illustration of this cable configuration
- Refer to Table 13 on page 46 for the planning information used in this illustration
- The information provided in Appendix D, "Cabling the HPS," on page 337 is based on alternating switch cables

Note: Cabling the switch network using the alternating pattern will simplify conversion to a dual network configuration.

Attention: Review the planning information provided in Table 11 on page 42, Table 12 on page 44, and Table 13 on page 46. These tables show how the switch cable connection order and the associated switch port locations change with network size and cable configuration.

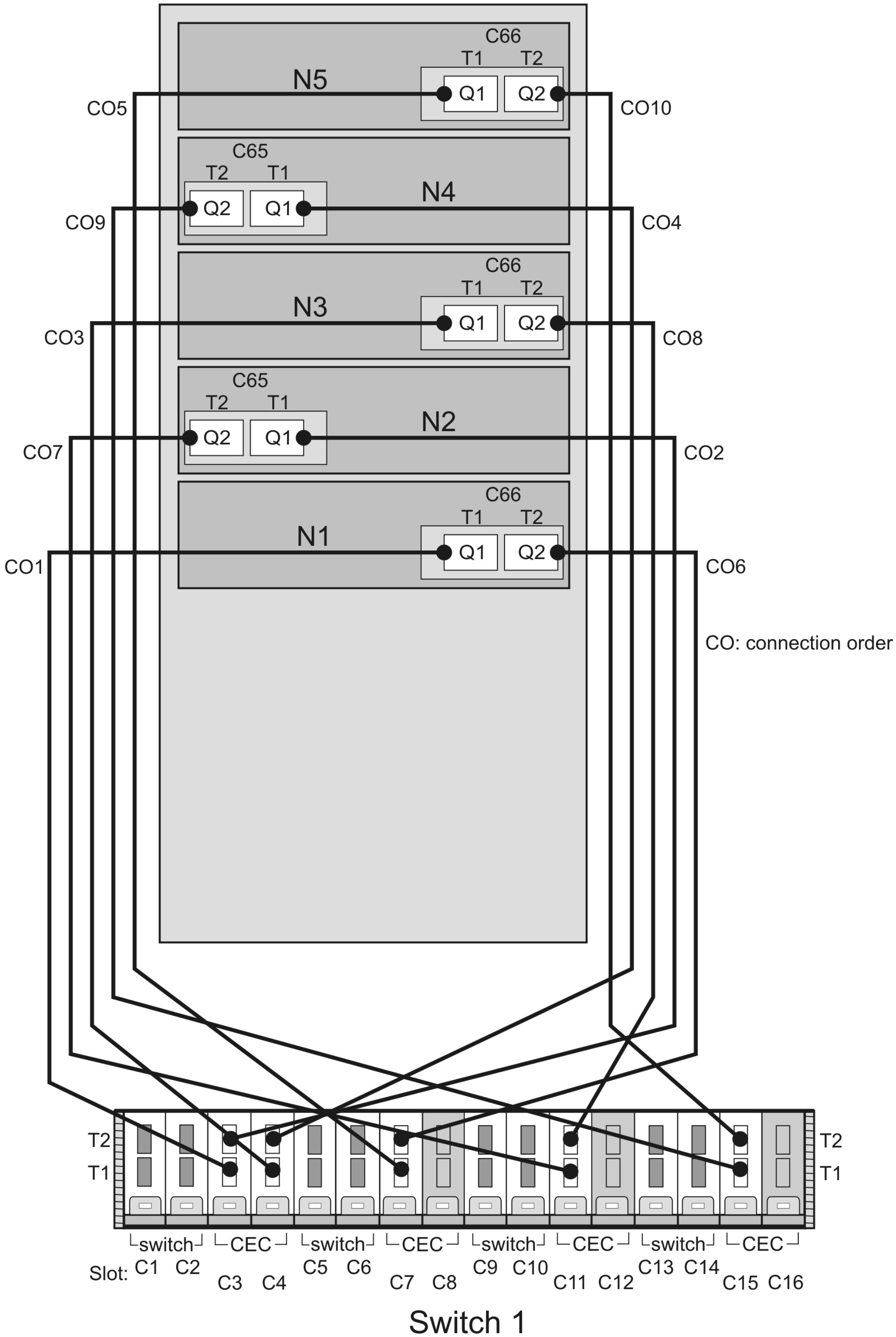


Figure 12. Single network switch configuration with one NSB using sequential switch cabling

Table 11. SNI to switch port locations for Figure 12 on page 41

Server number (N)	SNI location (S1 to S4)	SNI port number (Q1 or Q2)	SNI link address (N_S_Q)	Connection order	Corresponding switch port location	Switch cable serial number
N1	S1	Q1	N1S1Q1	1	S1C3T1	
N1	S1	Q2	N1S1Q2	6	S1C7T2	
N2	S2	Q1	N2S2Q1	2	S1C3T2	
N2	S2	Q2	N2S2Q2	7	S1C11T1	
N3	S1	Q1	N3S1Q1	3	S1C4T1	
N3	S1	Q2	N3S1Q2	8	S1C11T2	
N4	S2	Q1	N4S2Q1	4	S1C4T2	
N4	S2	Q2	N4S2Q2	9	S1C15T1	
N5	S1	Q1	N5S1Q1	5	S1C7T1	
N5	S1	Q2	N5S1Q2	10	S1C15T2	

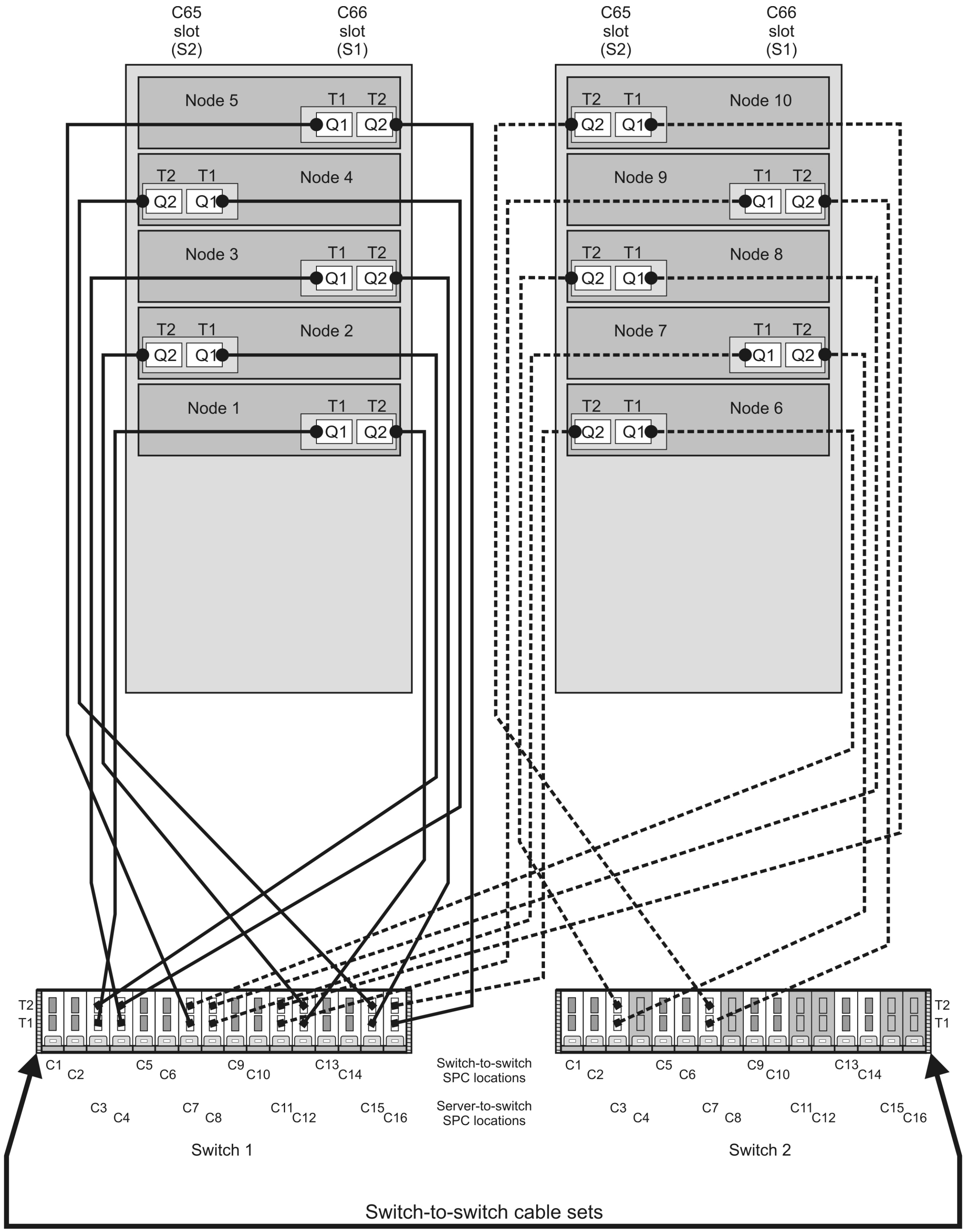


Figure 13. Single network switch configuration with two, non-paired, NSBs using sequential switch cabling.

Note: Each non-paired switch must be fully populated before cabling the next switch.

Table 12. SNI to switch port locations for Figure 13 on page 43

Server number (N)	SNI location (S1 to S4)	SNI port number (Q1 or Q2)	SNI link address (N_S_Q)	Connection order	Corresponding switch port location	Switch cable serial number
N1	S1	Q1	N1S1Q1	1	S1C3T1	
N1	S1	Q2	N1S1Q2	11	S1C12T7	
N2	S2	Q1	N2S2Q1	2	S1C3T2	
N2	S2	Q2	N2S2Q2	12	S1C12T2	
N3	S1	Q1	N3S1Q1	3	S1C4T1	
N3	S1	Q2	N3S1Q2	13	S1C15T1	
N4	S2	Q1	N4S2Q1	4	S1C4T2	
N4	S2	Q2	N4S2Q2	14	S1C15T2	
N5	S1	Q1	N5S1Q1	5	S1C7T1	
N5	S1	Q2	N5S1Q2	15	S1C16T1	
N6	S2	Q1	N6S2Q1	6	S1C7T2	
N6	S2	Q2	N6S2Q2	16	S1C16T2	
N7	S1	Q1	N7S1Q1	7	S1C8T1	
N7	S1	Q2	N7S1Q2	17	S2C3T1	
N8	S2	Q1	N8S2Q1	8	S1C8T2	
N8	S2	Q2	N8S2Q2	18	S2C3T2	
N9	S1	Q1	N9S1Q1	9	S1C11T1	
N9	S1	Q2	N9S1Q2	19	S2C7T1	
N10	S2	Q1	N10S2Q1	10	S1C11T2	
N10	S2	Q2	N10S2Q2	20	S2C7T2	

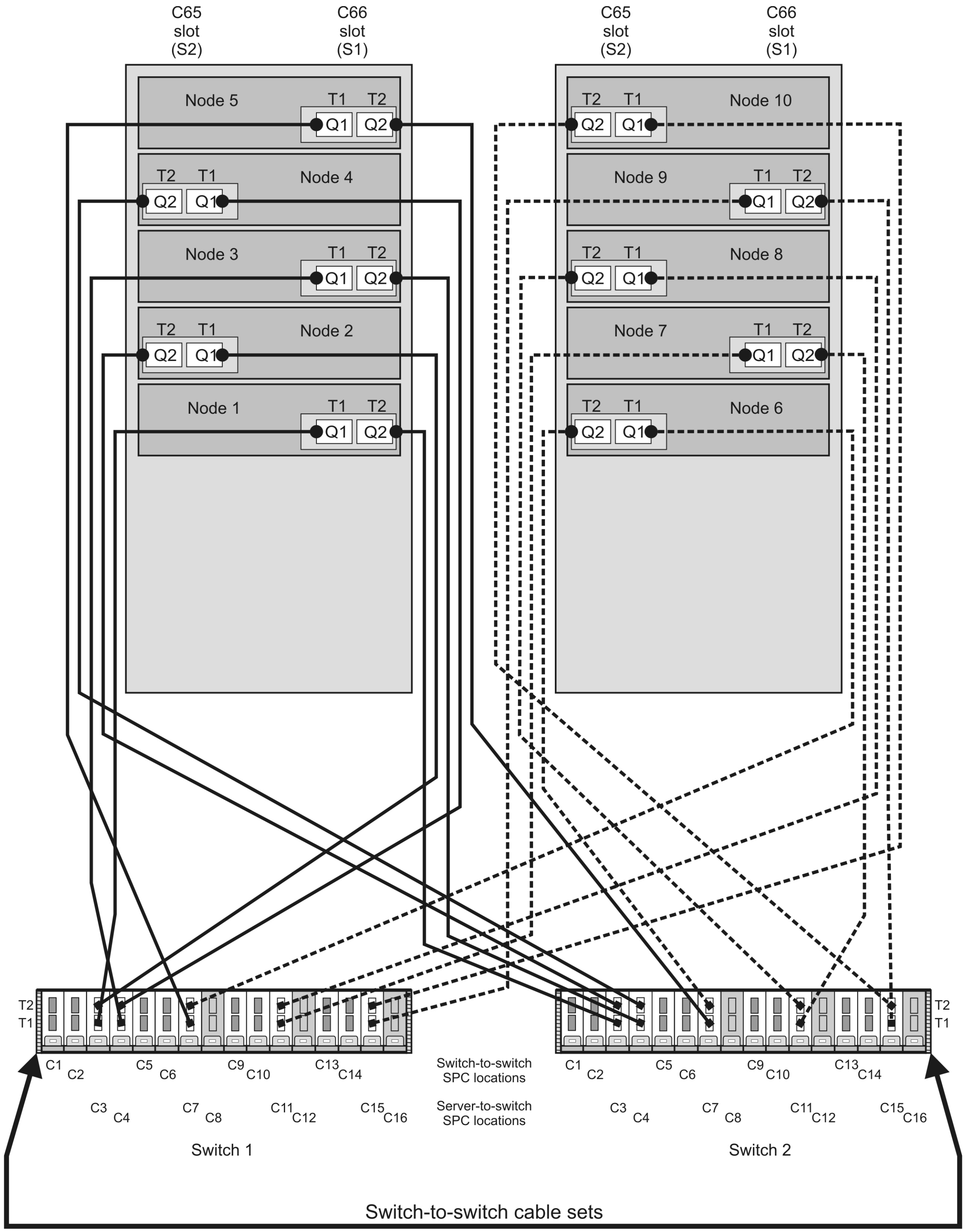


Figure 14. Single network switch configuration with paired NSBs using alternating switch cabling

Table 13. SNI to switch port locations for Figure 14 on page 45

Server number (N)	SNI location (S1 to S4)	SNI port number (Q1 or Q2)	SNI link address (N_S_Q)	Connection order	Corresponding switch port location	Switch cable serial number
N1	S1	Q1	N1S1Q1	1	S1C3T1	
N1	S1	Q2	N1S1Q2	1	S2C3T1	
N2	S2	Q1	N2S2Q1	2	S1C3T2	
N2	S2	Q2	N2S2Q2	2	S2C3T2	
N3	S1	Q1	N3S1Q1	3	S1C4T1	
N3	S1	Q2	N3S1Q2	3	S2C4T1	
N4	S2	Q1	N4S2Q1	4	S1C4T2	
N4	S2	Q2	N4S2Q2	4	S2C4T2	
N5	S1	Q1	N5S1Q1	5	S1C7T1	
N5	S1	Q2	N5S1Q2	5	S2C7T1	
N6	S2	Q1	N6S2Q1	6	S1C7T2	
N6	S2	Q2	N6S2Q2	6	S2C7T2	
N7	S1	Q1	N7S1Q1	7	S1C11T1	
N7	S1	Q2	N7S1Q2	7	S2C11T1	
N8	S2	Q1	N8S2Q1	8	S1C11T2	
N8	S2	Q2	N8S2Q2	8	S2C11T2	
N9	S1	Q1	N9S1Q1	9	S1C15T1	
N9	S1	Q2	N9S1Q2	9	S2C15T1	
N10	S2	Q1	N10S2Q1	10	S1C15T2	
N10	S2	Q2	N10S2Q2	10	S2C15T2	

Server-to-switch cable options for dual network configurations

Each network in a dual network configuration may have an odd number of switches and links. However, the overall system configuration must have an even number of switches and an even number of links. Therefore, you **must** cable the switch boards as described in Appendix D, “Cabling the HPS,” on page 337.

- All switches in a dual network configuration are referred to as paired switches
- One switch of each pair is on each network
- This specific configuration does not require switch-to-switch cables
- Refer to Figure 15 on page 47 for an illustration of this cable configuration
- Refer to Table 14 on page 48 for the planning information used in this illustration
- The information provided in Appendix D, “Cabling the HPS,” on page 337 is based on alternating switch cables

Attention: Compare Figure 15 on page 47 and Figure 14 on page 45 and the associated planning information in Table 14 on page 48 and Table 13. These illustrations and tables show how a single network configured with paired switches can be converted to a dual network configuration by removing switch-to-switch cables.

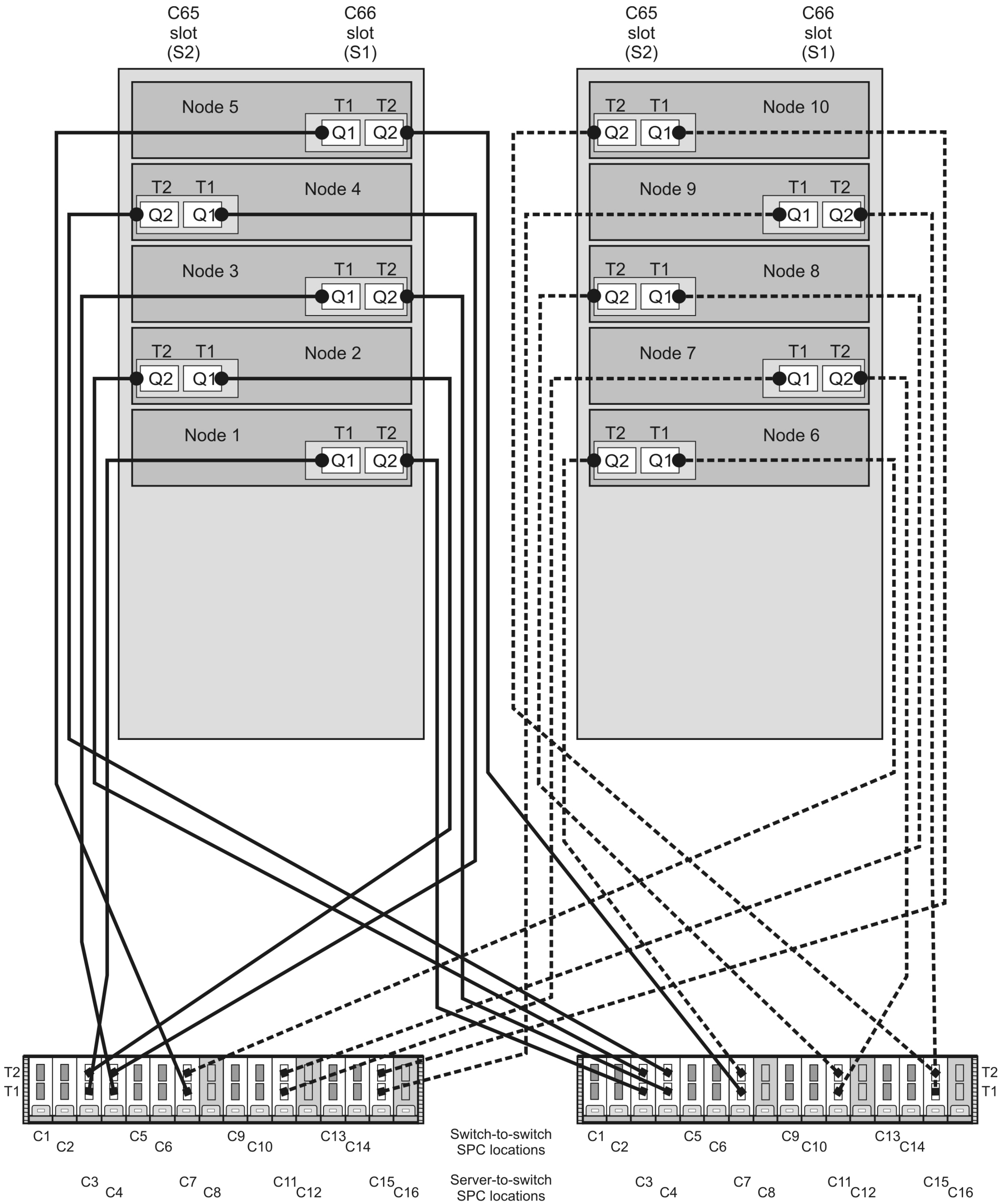


Figure 15. Dual network switch configuration.

Table 14. SNI to switch port locations for Figure 15 on page 47

Server number (N)	SNI location (S1 to S4)	SNI port number (Q1 or Q2)	SNI link address (N_S_Q)	Connection order	Corresponding switch port location	Switch cable serial number
N1	S1	Q1	N1S1Q1	1	S1C3T1	
N1	S1	Q2	N1S1Q2	1	S2C3T1	
N2	S2	Q1	N2S2Q1	2	S1C3T2	
N2	S2	Q2	N2S2Q2	2	S2C3T2	
N3	S1	Q1	N3S1Q1	3	S1C4T1	
N3	S1	Q2	N3S1Q2	3	S2C4T1	
N4	S2	Q1	N4S2Q1	4	S1C4T2	
N4	S2	Q2	N4S2Q2	4	S2C4T2	
N5	S1	Q1	N5S1Q1	5	S1C7T1	
N5	S1	Q2	N5S1Q2	5	S2C7T1	
N6	S2	Q1	N6S2Q1	6	S1C7T2	
N6	S2	Q2	N6S2Q2	6	S2C7T2	
N7	S1	Q1	N7S1Q1	7	S1C11T1	
N7	S1	Q2	N7S1Q2	7	S2C11T1	
N8	S2	Q1	N8S2Q1	8	S1C11T2	
N8	S2	Q2	N8S2Q2	8	S2C11T2	
N9	S1	Q1	N9S1Q1	9	S1C15T1	
N9	S1	Q2	N9S1Q2	9	S2C15T1	
N10	S2	Q1	N10S2Q1	10	S1C15T2	
N10	S2	Q2	N10S2Q2	10	S2C15T2	

SNI installation restrictions

Depending on server type, some restrictions apply to SNI installation. These restrictions are described in:

- "SNI restrictions (M/T 9119-590 and M/T 9119-595)"
- "SNI restrictions (M/T 9118-575)" on page 49

SNI restrictions (M/T 9119-590 and M/T 9119-595)

- Required network interface: 1-Link SNI card (**FC 7817**)
- **FC 7817** must be ordered and installed in pairs
- p5-590 servers may have either two or four **FC 7817** installed
- p5-595 servers may have two, four, six, or eight **FC 7817** installed
- SNIs are restricted to processor slot 8 and slot 9 (refer to Figure 16 on page 49)

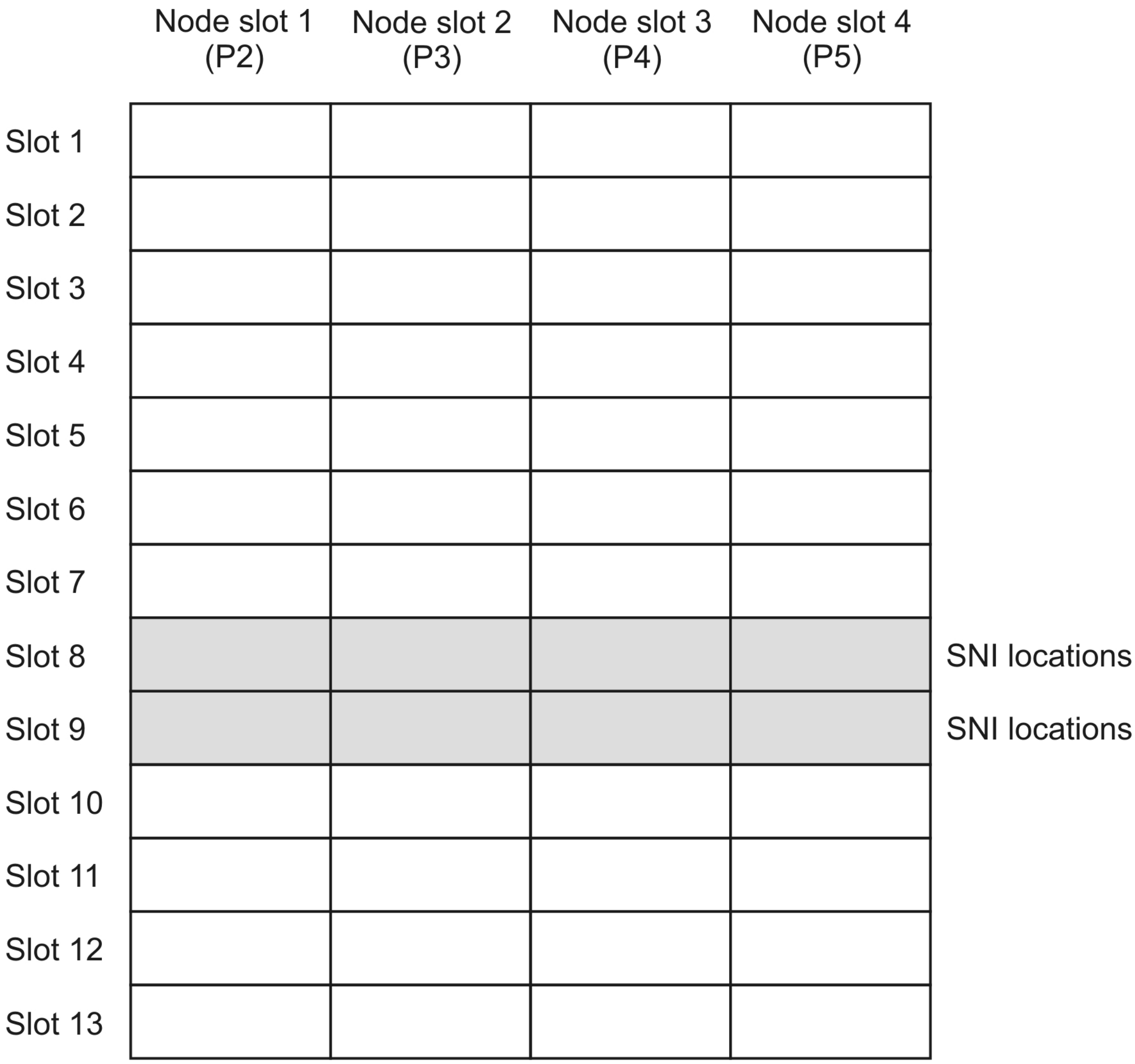


Figure 16. Book slot locations for p5-590 and p5-595 servers

SNI restrictions (M/T 9118-575)

- Required network interface: 2-Link SNI card (**FC 7910**)
- p5-575 servers must have one **FC 7910**
- The first p5-575 server in the rack must have **FC 7910** installed in GX slot C66
- The second p5-575 server in the rack must have **FC 7910** installed in GX slot C65
- Continue SNI installation by alternating GX bus slot from C66 to C65 as you move up the rack
  - The alternating pattern is required for cable management
- As you install p5-575 servers in additional racks, continue installing **FC 7910** SNIs:
  - In the C66 slot if the node is an odd numbered node
  - In the C65 slot if the node is an even numbered node
- Refer to Figure 17 on page 50 for the C66 and C65 slot locations

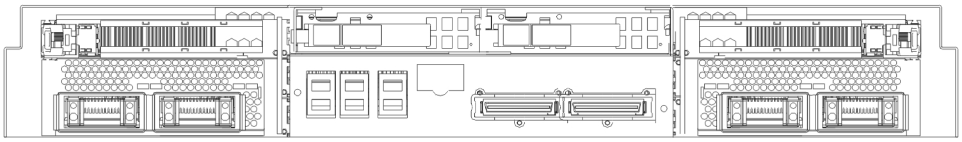


Figure 17. GX slot location for p5-575 servers

Chapter 4. System management components

A Cluster 1600 configured with the HPS and IBM eServer p5 servers requires the following components for system administration and hardware control:

- “Cluster service network”
- “CSM Management Server” on page 55
- “Hardware Management Console” on page 58

Attention: If the cluster is configured with IBM eServer p5 servers and the High Performance Switch, you must install the High Performance Switch Network Manager (HPSNM) software on the Management Server and run it from that location. You cannot run HPSNM from the HMC if the cluster is configured with IBM eServer p5 servers and the High Performance Switch.

Cluster service network

Instead of using a serial connected Administrative LAN, a Cluster 1600 configured with the HPS and IBM eServer p5 servers uses an Ethernet network, called the ″cluster service network,″ for all system administration and monitoring activities. The cluster service network connects the CSM Management Server, all HMCs, the server FSPs, and frame BPCs.

During installation, you have the option of configuring the cluster service network hardware as either a simple, non-redundant network or as a fault tolerant redundant network.

- Refer to Figure 18 on page 52 for a detailed view of a single cluster service network
- Refer to Figure 19 on page 53 for a detailed view of redundant service network

Note: If you elect to set up a redundant cluster service network, you do not have to make any system administration changes. The standard cluster software installation recognizes the redundant hardware and provides automatic failover should a system fault occur.

The cluster service network requires several software packages that must be installed on either the Management Server or on the HMC. These components include:

- On the CSM Management Server
  - “Cluster-Ready Hardware Server” on page 57 for hardware administration and DHCP configuration
  - Appendix E, “High Performance Switch Network Manager (HPSNM),” on page 465 for switch network configuration, diagnostics, and control
- On the HMCs
  - “Electronic Service Agent” on page 61 monitors system for hardware errors and reports problems if permitted
  - “Inventory Scout” on page 62 for viewing system information about installed hardware and microcode
  - “Service Focal Point” on page 62 for viewing event logs and for problem determination

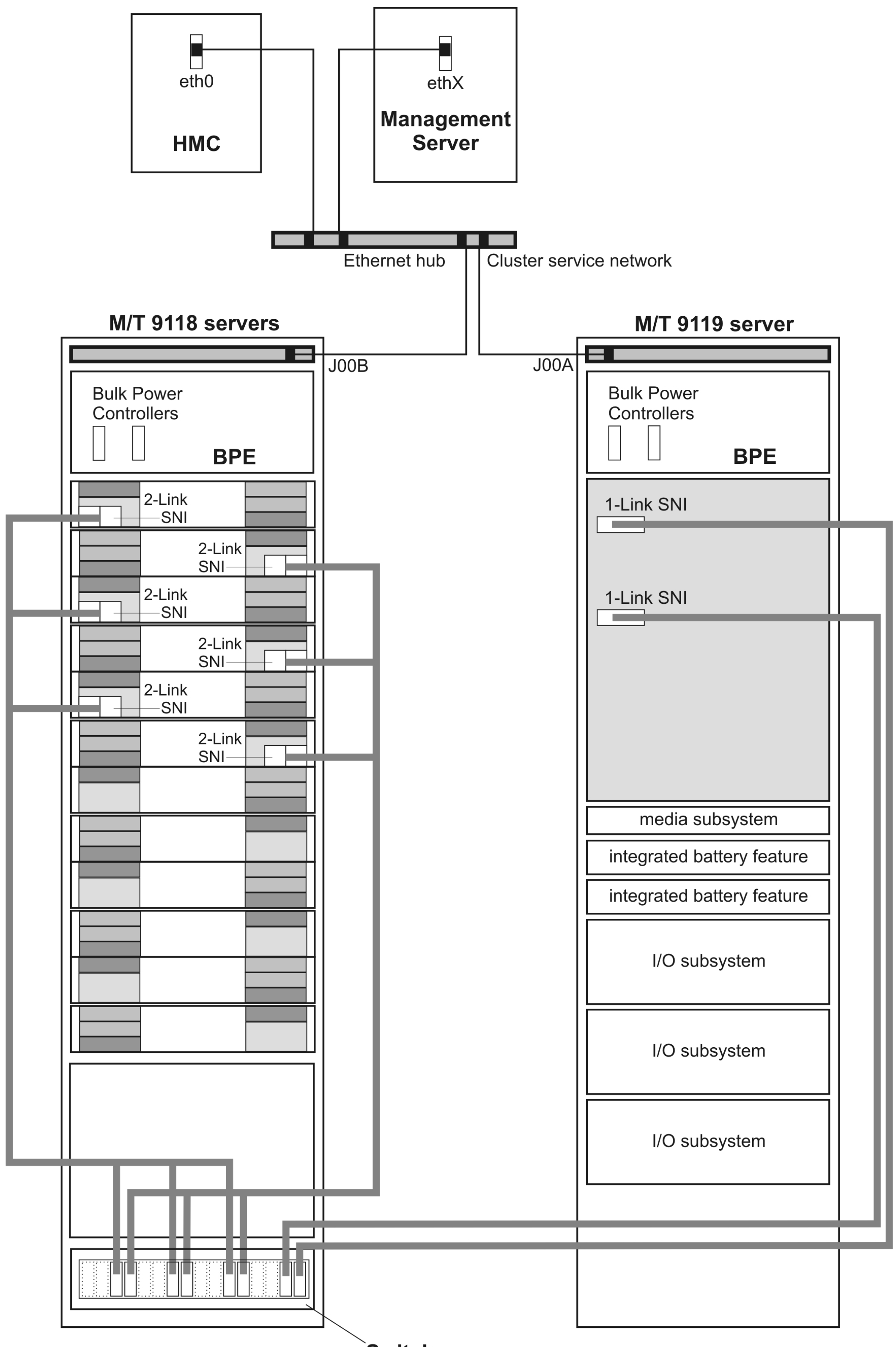


Figure 18. Non-redundant cluster service network configuration. **Note:** *"Connecting the cluster service network" on page 54 provides detailed descriptions of the Ethernet ports used for the cluster service network.*

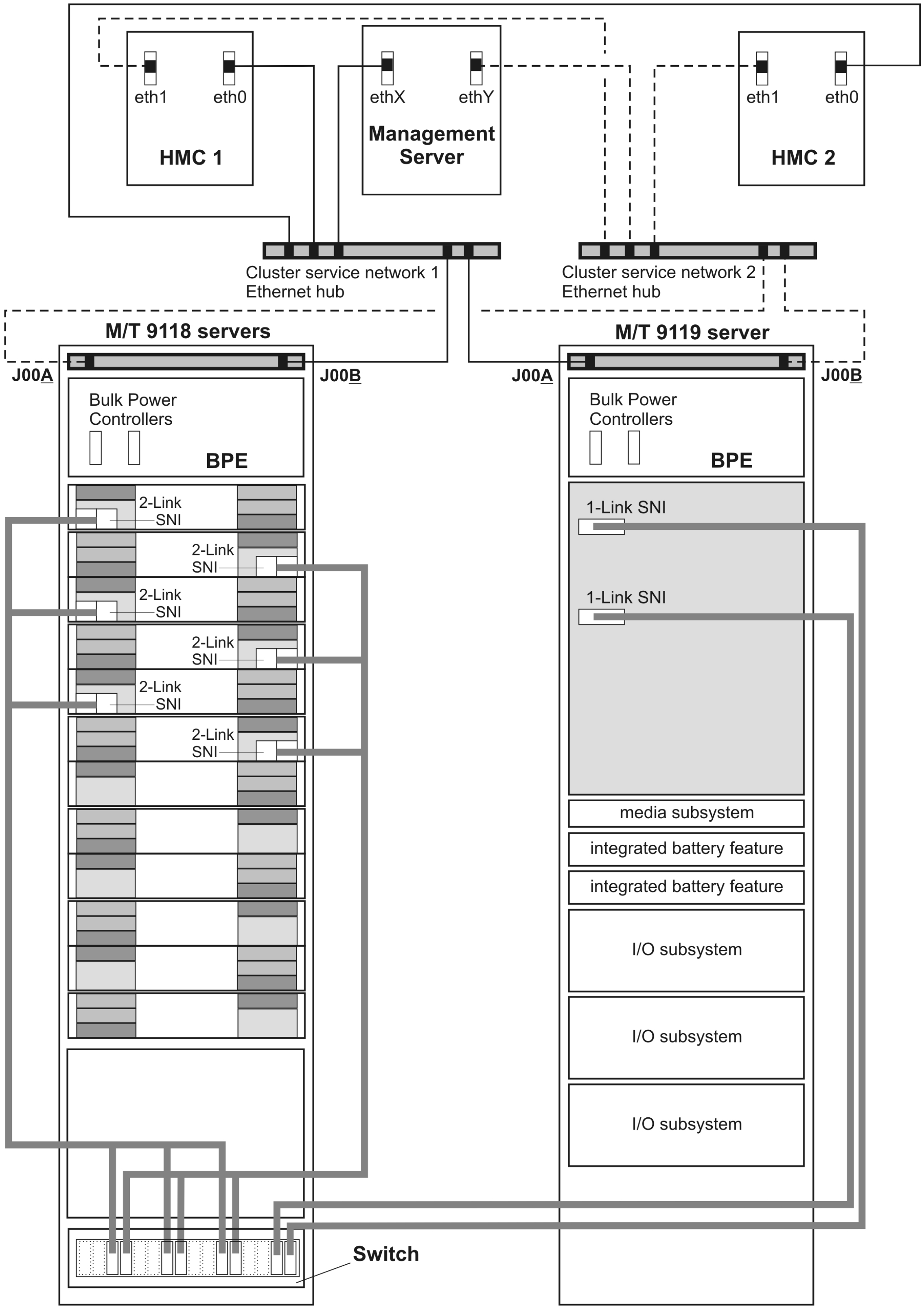


Figure 19. Redundant cluster service network configuration. **Note:** *"Connecting the cluster service network" on page 54 provides detailed descriptions of the Ethernet ports used for the cluster service network.*

Connecting the cluster service network

Depending on how you configure the system, the cluster service network requires several connections between network components.

- **Non-redundant cluster service networks** require a single Ethernet network with connections between:
  - An Ethernet port configured as ethX with DHCP server permission on the CSM Management Server
    - Refer to Management Server connections for a detailed description of ethX
  - The eth0 port on each HMC
    - Refer to HMC connections for a detailed description of eth0
    - Do not configure DHCP on the HMCs
  - BPC port J00A on all switch-only frames
  - BPC port J00A on all p5-590 and p5-595 (M/T 9119) server frames connected to the switch network
  - BPC port J00B on all p5-575 (M/T 9118) server frames connected to the switch network
  - Refer to Figure 18 on page 52
- **Redundant cluster service networks** require two independent Ethernet networks:
  1. The primary cluster service network requires connections between:
     - An Ethernet port configured as ethX with DHCP server permission on the CSM Management Server
       - Refer to Management Server connections for a detailed description of ethX
     - The eth0 port on each HMC
       - Refer to HMC connections for a detailed description of eth0
       - Do not configure DHCP on the HMCs
     - BPC port J00A on all switch-only frames
     - BPC port J00A on all p5-590 and p5-595 (M/T 9119) server frames connected to the switch network
     - BPC port J00B on p5-575 (M/T 9118) server frames connected to the switch network
  2. The secondary cluster service network requires connections between:
     - An Ethernet port configured as ethY with DHCP server permission on the CSM Management Server
       - Refer to Management Server connections for a detailed description of ethY
     - The eth1 port on each HMC
       - Refer to HMC connections for a detailed description of eth1
     - BPC port J00B on all switch-only frames
     - BPC port J00B on p5-590 and p5-595 (M/T 9119) server frames connected to the switch network
     - BPC port J00A on p5-575 (M/T 9118) server frames connected to the switch network
  3. Refer to Figure 19 on page 53

Notes:

1. After all cluster service network connections are in place, make certain that High Performance Switch Network Manager (HPSNM) has been enabled on the CSM Management Server.
2. All 24 inch frames have preconnected internal service networks using frame mounted Ethernet hubs. With this configuration, the external service network only requires a single connection to the appropriate hub. Do not make Ethernet connections to other frame components.
3. Additional Ethernet hubs, adapters, and cables may be required and they must be supplied by the customer.
4. To simplify service, you may want to mount all cluster service network components in a standard 19 inch frame. Rack mounted HMCs are available for these frames but the frame **must** be supplied by the customer.

Frame connections

Each frame has an integral Ethernet hub with RJ-45 ports. Only BPC port J00A and J00B may have external Ethernet connections. The actual port used for each installation depends on frame type and service network configuration. While you are connecting the cluster service network:

- Make certain that you are using the correct port for the frame type
- Make certain that the primary and secondary networks are routed to the correct ports

Note: Except for J00A and J00B, all the other ports on the integral Ethernet hub are reserved for internal components of the frame. For external connections, you may only use BPC ports J00A and J00B.

Management Server connections

The Ethernet ports used for the cluster service network are shown as ethX and ethY. These ports can be any adapter on the Management Server such as eth0, eth1, or eth2. However, the preferred installation is to use eth0 as primary cluster service network adapter and eth1 as the secondary network adapter. The difference between ethX and ethY gets defined by how these ports are connected to the other ports on the cluster service network. Refer to Figure 18 on page 52 and Figure 19 on page 53 for network routing.

The requirements for ethX and ethY are:

- The adapter must support the 100 Mb Ethernet Standard
- The ports must be configured with DHCP server permission
- If you are using a redundant cluster service network, the primary cluster service network must be connected to ethX and the secondary network must be connected to the ethY port

Note: If you are using a simple, non-redundant cluster service network, the ethY port can be connected to a public network or a CSM install network.

HMC connections

An HMC may have several Ethernet adapters, both integrated and from additional adapter cards. Because of that, it is important that you verify that you have selected eth0 and eth1 (if required) for the cluster service network. For a simple, non-redundant service network, you must connect the HMC through the eth0 port. If you are configuring a redundant cluster service network, then you must use eth0 for the primary network and eth1 for the secondary network.

Note: You can use any additional HMC Ethernet ports for connections to public networks.

Service network communication

The standard cluster service network topology allows all components to communicate with each other. For example, any HMC can be configured to manage any frame without moving any cables. Because of this property, extra HMCs can be put on the service network as spares in an N+1 configuration. The spare HMC can be used as a standby in the event that an active HMC fails.

Note: Redundant HMCs are not supported on switch-only frames. However, each cluster component can be connected to multiple HMCs for improved availability.

CSM Management Server

Attention: The System Administrator must create a service login ID and password for the Management Server. This ID provides access to root level system diagnostic functions without exposing sensitive directories or commands. Refer to “Service login ID” on page 56 for additional information.

Attention: The DHCP server for an HPS cluster must be on the CSM Management Server and not an HMC.

In addition to HMCs, if the cluster is configured with IBM @server p5 servers and the High Performance Switch, you must install a CSM Management Server for cluster control. With this configuration, High Performance Switch Network Manager (HPSNM) is still used for cluster control. However, you must install HPSNM on the Management Server and run it from that location.

Hardware requirements for the Management Server include:

- The Management Server must be a workstation capable of running AIX 5L 5.2 or later
- The machine must have a CD-ROM or equivalent drive that is capable of reading CD-ROMs and the drive must be defined as cd0
- A minimum of 1024 MB of memory and 120 MB of disk space is required for installing CSM
- An additional 1.5 GB of disk space is required for installing the AIX operating system and CSM
- For each managed node, a minimum of 256 MB of memory and 20 MB of disk space is required for CSM
- Additional disk space as appropriate
- Ethernet ports for administrative LAN use

Note: Multiple CSM Management Servers are not supported.

For additional information refer to *IBM Cluster Systems Management for AIX 5L: Planning and Installation Guide* SA22-7919.

Service login ID

Some service actions require access to specific High Performance Switch Network Manager (HPSNM) functions as well as remote access to HPSNM from cluster HMCs. However, the HPSNM functions and remote access require root authority on the CSM Management Server. To avoid potential security problems, the System Administrator has two options for assigning login IDs for service events:

Software generated ID

AIX contains an optional fileset called `csm.hpsnm` that the System Administrator can install on the CSM Management Server at any time. This fileset contains the `setup_service` script that can automatically assign (and remove) permissions to all directories that must be accessed during a typical service call. In addition, this script also creates a service ID and password that provides temporary root access to the system.

Note: The `setup_service` script is located in the `/opt/csm/hpsnm/tools/bin` subdirectory.

Manually generated ID

For tighter security, the System Administrator can manually create a service ID and password. As a minimum requirement, the System Administrator will also have to assign specific permissions to the following directories for access to commands and data:

- Directories requiring read and execute access for commands:
  - `/opt/csm/hpsnm/bin`
  - `/opt/csm/hpsnm/lib`
  - Execute permission required for directories above this level
- Directories requiring read and execute access for data:
  - `/var/opt/csm/hpsnm/log`
  - `/var/opt/csm/hpsnm/data`
  - Execute permission required for directories above this level

Attention: Assigning read and execute permission to the required directories may open access to other directories containing sensitive data or system commands. It is the responsibility of the System Administrator to make certain that these directories remain protected:

- `/opt/csm/hpsnm/tools`
  - Contains engineering tools. If used improperly, these tools could disrupt the system
- `/var/opt/csm/*`
  - Do not protect `/var/opt/csm/hpsnm` and its sub-directories

Note: As an alternative, the System Administrator may assign someone with root access to work with you. If this alternative is used, that person is responsible for interacting with the High Performance Switch Network Manager (HPSNM) GUI and any command line functions required for those tasks.

For additional information refer to *IBM Cluster Systems Management for AIX 5L: Administration Guide* SA22-7918.

Cluster-Ready Hardware Server

Cluster-Ready Hardware Server concepts

Attention: Cluster-Ready Hardware Server (CRHS) is a required software package for Cluster 1600 systems configured with IBM @server p5 servers and the High Performance Switch.

The requirement for Cluster-Ready Hardware Server software is directed by the hardware configuration used for system management. Because some cluster management functions are controlled by the Management Server and other functions are controlled by the HMCs, all cluster components belong to two domains:

- The domain where HMCs monitor component resources
- The domain controlled by the CSM Management Server

As clusters increase in size, the issues associated with coordinating management tasks and resource allocation across these domains increase in complexity. To reduce the complexity of these issues, Cluster-Ready Hardware Server (CRHS) software functions as a communication bridge between cluster domains. By providing this bridge, CRHS allows you to use the CSM Management Server to interact with all of the HMCs within the cluster.

In addition to simplifying HMC access, CRHS simplifies cluster management by providing:

- Enhanced hardware discovery
- A central database for cluster hardware information
- A single location for performing installation and configuration tasks such as setting frame numbers and passwords
- Reduced HMC requirements for recovery
- Simplifies allocation of server resources between HMCs
- Reduced requirements for DHCP servers in large clusters

Enabling Cluster-Ready Hardware Server

Cluster-Ready Hardware Server is part of the CSM software package. You must enable this software on the Management Server by configuring the CRHS environment. When the CRHS software is fully enabled, HPSNM will use the configuration data stored in the CRHS database to determine what hardware is in the cluster. After the discovery process is complete, you will be able to access multiple HMCs and issue commands across the cluster from the Management Server.

For additional information refer to:

- *IBM Cluster Systems Management for AIX 5L: Administration Guide* SA22-7918

- *IBM Cluster Systems Management for AIX 5L: Planning and Installation Guide* SA22-7919

Hardware Management Console

Attention: The DHCP server for an HPS cluster must be on the CSM Management Server and not an HMC.

A Cluster 1600 configured with the HPS requires one or more Hardware Management Consoles (HMCs). From this set of HMCs, you must select an ELA Master HMC and, if it is required, an ELA Backup HMC. Although each HMC provides a control point for network components and a collection point for Service Focal Point error logs, the Master HMC is the only location where switch related errors will be recorded.

Notes:

1. If you make significant changes to network topology and you need to reboot the HMC, you are also required to perform a network cold start. Refer to "Required cluster cold start" on page 168 for details.
2. Redundant HMCs are not supported on switch-only frames. However each cluster component can be connected to multiple HMCs for improved availability.

The HPS requires a minimum of Model 7315-C01 as the HMC. Refer to "Hardware Management Consoles supported with Cluster 1600 systems" on page 59 for a complete list of supported HMCs and to "Cluster 1600 systems with multiple HMCs" for scaling and configuration information.

Note: When you configure the Cluster 1600 with multiple HMCs, you must load all HPS related software and firmware on all network HMCs. After completing the code updates, you must verify that all HMCs are at the same code and APAR levels. Refer to "Firmware installation" on page 104 for details on performing the HMC code load.

Cluster 1600 systems with multiple HMCs

A Cluster 1600 system may have multiple HMCs because it is either too large for a single HMC or because you want the availability offered by multiple HMCs. As a *minimum* configuration, a Cluster 1600 system that exceeds the maximum number of servers supported by one HMC requires multiple, non-redundant HMCs (refer to "Servers supported by each HMC"). In a non-redundant configuration, each HMC has redundant paths to the frame but the HMCs are not redundant. If one HMC fails, you will have to manually switch system management functions to the other HMC.

Notes:

1. When you configure the Cluster 1600 with multiple HMCs, you must load all HPS related software and firmware on all network HMCs. After completing the code updates, you must verify that all HMCs are at the same code and APAR levels. Refer to "Firmware installation" on page 104 for details on performing the HMC code load.
2. All server and switch-only frames **must** have an Ethernet connection to at least one HMC. The procedure for connecting Ethernet cables is defined in "Connecting multiple HMCs to the cluster service network" on page 59.

Servers supported by each HMC

The following information applies to HMCs used in a Cluster 1600 configured with the HPS. In these systems, each non-redundant HMC or redundant HMC pair can support one of the following configurations:

- A total of sixteen p5-590 and p5-595 servers
- Thirty-two p5-575 servers
- A combination of p5-575, p5-590, and p5-595 servers where the total does not exceed thirty-two servers and no more than sixteen of the servers are p5-590, or p5-595 servers
- Up to sixty-four LPARs per HMC

Notes:

1. While you are adding frames to the HMC, **you must use** `abc123` as the Frame Authentication Password. Cluster-Ready Hardware Server (CRHS) is keyed to the `abc123` password. Use of any other password during frame installation **will** cause problems later in the system installation.
2. Each p5-575 server frame will support up to two HPS assemblies.
3. Each p5-590 or p5-595 server frame will support one HPS assembly.
4. The presence of a switch in the server frame does not affect the number of servers supported on the HMC.
5. Switch-only frames also require an Ethernet connection to the HMC. However, switch-only frames do not reduce the total number of servers supported on the HMC.

Connecting multiple HMCs to the cluster service network

If the size of a cluster requires multiple HMCs, **all** HMCs in the cluster must be configured to work together.

1. Verify that each HMC is connected to the cluster service network using the eth0 port on the HMCs
2. Make certain that High Performance Switch Network Manager (HPSNM) has been enabled on the CSM Management Server

Note: Redundant HMCs are not supported on switch-only frames. However each cluster component can be connected to multiple HMCs for improved availability.

Hardware Management Consoles supported with Cluster 1600 systems

Table 15 lists the machine types supported as HMCs.

Table 15. Supported Hardware Management Consoles

Machine type	Model
7310	C04
7310	CR3
7315	C01 (minimum requirement)
7315	C02
7315	CO3
7315	CR2 (rack mount)

HMC interface adapters

In addition to the HMC integrated Ethernet adapters, Cluster 1600 configurations support the following PCI adapters:

FC 4962
10/100 Mbps Ethernet PCI adapter II

FC 2969
Gigabit Ethernet SX PCI adapter

FC 2975
10/100/1000 BASE-T Ethernet PCI adapter

Note: Administrative LAN communications are restricted to 10/100 MB Ethernet.

HMC diagnostic tools

The HMC supplies the following set of software tools for the switch network and managed servers:

- Electronic Service Agent (reporting tool)

- Inventory Scout (survey tool)
- Service Focal Point (reporting and diagnostic tool)

These applications are preinstalled on the HMC and work with High Performance Switch Network Manager (HPSNM) to generate reports on the health of the switch network. For additional information on configuring and using these applications, refer to Chapter 5, “Electronic Service Agent, Inventory Scout, and Service Focal Point,” on page 61.

Chapter 5. Electronic Service Agent, Inventory Scout, and Service Focal Point

The HPS requires three service applications that must be configured on the Hardware Management Console. These applications work together to monitor the health of the system and report potential problems to IBM. For detailed information regarding configuration of the following service applications, refer to the documentation supplied with the HMC:

- “Electronic Service Agent”
- “Inventory Scout” on page 62
- “Service Focal Point” on page 62

Electronic Service Agent

Electronic Service Agent (also referred to as Service Agent) is installed on the HMC and monitors the system for hardware errors. Service Agent uses the diagnostic functions provided by AIX, the service processor, and Service Focal Point and then transmits that information to IBM. Service Agent functions include:

- Providing user definable thresholds for error reporting
- Automatic problem analysis
- Automatic problem reporting
- Automatic customer notification

The HPS forwards its Service Agent messages to the Hardware Management Console. Depending on your configuration, the HMC transmits these error messages through the system modem to the System Administrator or IBM.

Setting up Electronic Service Agent services

To configure Service Agent for the Cluster 1600 system, perform the following:

1. Manually configure Service Agent on the HMC for the HPS using the switch machine type.
2. Configure Service Agent to forward messages to the system.
3. Configure Service Agent on the HMC to forward messages using the attached modem.

These functions are performed from the HMC by starting the **Navigation** panel, opening the **Service Applications** folder, and selecting **Service Agent**.

Note: For detailed Service Agent configuration instructions, refer to the documentation provided with the HMC.

Modem requirements

In order to report problems, Electronic Service Agent requires a modem attached to an available serial port on the HMC. Since the modem transmits fault messages over local telephone lines, an analog phone line is also required. The telecommunication cable plugs and ac power cable plugs vary according to the country code used for the system order. This package includes:

- An IBM compatible modem (minimum 9600 bps baud rate)
- A 9-pin to 25-pin serial cable
- A 15-meter, 25-pin extension cable

The customer must supply the following:

- A dial-up, analog telephone line (public switched network) with 24-hour, 7-day availability
- A telephone extension cable to connect the modem to the phone jack

Notes:
1. Digital telephone lines cannot be used.
2. Use the S2 serial port for the Service Agent modem.
3. Electronic Service Agent can also report problems using a VPN Internet connection.

You can find instructions for service personnel about installing, operating, and registering Service Agent in *Service Agent for pSeries Hardware Management Console Users Guide*.

Inventory Scout

Inventory Scout surveys your system for information about installed hardware and microcode. Some Inventory Scout survey functions run in the background and gather information used by service applications such as Electronic Service Agent. However, you can directly access other Inventory Scout functions from the HMC GUI. Whether or not you manually invoke Inventory Scout depends on the procedure you are performing. Two of the primary Inventory Scout functions are:
- VPD collection and transmission
- Microcode management

Note: For detailed Inventory Scout information, refer to the documentation provided with the HMC.

VPD collection and transmission

Vital Product Data (VPD) contains hardware configuration information from the system. This data is intended to be collected and transmitted to IBM, where it is stored for use in planning for MES upgrades, hardware tracking, and problem determination. There are several methods to collect and send VPD to IBM. The method you apply depends on how your system is connected to external networks. Refer to "Collecting Vital Product Data (VPD)" on page 154, for procedures describing how to apply these methods.

Microcode management from the HMC

Microcode levels can be checked, and device microcode updated from the HMC GUI using the following procedure:
1. Go to the ″Navigation Area″ on the HMC GUI
2. Click ″Information Center and Setup Wizard″
3. Click ″Launch the eServer Information Center″
4. Click ″Service, Support, and Troubleshooting″
5. Click ″Getting Fixes″
6. Click ″Firmware (Licensed Internal Code) fixes″
7. Click ″Applying firmware (Licensed Internal Code) fixes″
8. Click ″Get I/O adapter and device firmware fixes with an HMC (AIX)″

Service Focal Point

The Service Focal Point (SFP) application runs on the HMC and provides a user interface for viewing events and performing problem determination. SFP resource managers monitor the system and record information about serviceable events. The application filters the data and groups information related to the triggering event. When appropriate, SFP also initiates a call to the service provider.

By grouping related service information, SFP reduces the complications of diagnosing problems in a partitioned system. Problem determination in a partitioned system is complicated by the fact that each partition functions independently but may share resources with another partition. As a result, more than one partition may report the same error. Service Focal Point recognizes repeating errors, filters them, and reports one serviceable event instead of a long list of repetitive call-home information.

Note: Service Focal Point collects hardware errors, such as PERMANENT errors from AIX and NON BOOT errors from service processors.

Using Service Focal Point

Service Focal Point configuration functions are performed from the HMC by accessing the **Navigation Area** of the GUI, opening the **Service Applications** folder, and selecting **Service Focal Point**.

Note: Service Focal Point must be installed on every HMC in a cluster. Because of that, you may have to review error logs on multiple HMCs to retrieve all the information related to a serviceable event. If the system has multiple HMCs:

- The error log on the ELA Master HMC list serviceable events for network link and switch component failures
- The error log on the controlling HMC list serviceable events for server components including internal SNI failures

From the Service Focal Point panel you can select the following options:

- Repair Serviceable Event
  - Use this panel for guidance with problem isolation and repair
- Manage Serviceable Event
  - Use this panel to review and select open service events
- Install/Add/Remove Hardware
- Exchange Parts
- Service Utilities
- Collect VPD Information

Note: For detailed Service Focal Point configuration instructions, refer to the documentation provided with the HMC.

Part 2. Installation and Service

CAUTION:
The doors and covers to the product are to be closed at all times except for service by trained service personnel. All covers must be replaced and doors locked at the conclusion of the service operation. (C013)

Part 2 of this book provides information related to the installation and service of the HPS by product-trained service personnel.

When performing HPS maintenance, the service person must follow **all** “Maintenance Analysis Procedures” beginning with the Start MAPs in this book. The Start MAPs will help you isolate the problem to one or more of these switch components:

- The switch planar
- Copper cable or fiber optic cable Switch Port Connection (SPC) card
- Ethernet LANs
- Cabling

Note: The information in this document can only be applied to clusters configured with IBM eserver IBM eserver p5 servers.

Note: If the diagnostic procedures indicate that device specific procedures are required, the information in this book will direct you to any additional manuals you might need.

If you cannot determine the cause of failure, you should request the assistance of the Cluster 1600 Field Support Center.

Part 2 contains the following chapters:

Chapter 6. Installation

Use this chapter to physically install an HPS in a Cluster 1600 system. This section divides the installation procedure for these systems into three sequential sections:

1. “Hardware installation”
2. “Firmware installation” on page 104
3. “Software installation” on page 106

Note: These procedures must be performed in the order listed.

Hardware installation

The following sections provide detailed procedures for installing switch hardware components. These procedures are arranged into several units:

- A set of common preinstallation tasks
- Installation tasks that are dependent on hardware configuration
- Additional hardware installation tasks
- A set of common post-installation tasks

Attention: When you are planning network connection endpoints, you **must** follow the link assignment procedures described in Appendix C, “HPS network configuration,” on page 305 and Appendix D, “Cabling the HPS,” on page 337. Those procedures follow a set of rules that provide optimum distribution of links across the system. Failure to adhere to those rules may result in network errors and performance degradation.

Preinstallation tasks for switch hardware

After you have verified that all preinstallation tasks are complete, continue with the appropriate switch installation procedure.

Customer responsibilities

- Make certain that installation planning information is complete
- Make certain that facility preparations are complete
- Inspect shipment for completeness and damage
- Review your inspection report with the IBM representative to verify Customer System Assurance (CSA) customer assurance

Installation engineer responsibilities

- Prior to installation, review the packing lists for each ship group and verify that you have all items shipped with the system
- Verify that the network service tool kit (PN 44P4060) is available
  - After completing installation, make certain that the network service tool kit is placed in the rack toolbox located at the bottom front of the rack
- Review the floor plan provided by the customer and verify that the floor space requirements have been met for each rack
- Verify that all frame components are available including:
  - Front and rear doors
  - Two power cords
  - EMC skirt
  - Frame extenders (if required)

Additional tools required

The additional tools listed here may be required for system installation. Make sure you have access to the following before you begin installation:

- Electronic service multimeter
- Lift tool
- Service vacuum
- Service ladder
- Stepladder

Installation tasks for switch hardware

There are several different hardware configurations for the HPS. Each configuration has specific installation procedures and you need to select the appropriate procedure for your installation:

- "Installing frames with an integral HPS"
- "Installing an HPS into an existing server frame" on page 70
- "Installing switch-only frames" on page 71

In addition to switch hardware installation, There are Additional hardware installation tasks that are associated with the switch. These tasks include:

- "SNI and UPIC installation" on page 88
- "Installing EMC shielding" on page 89
- "Cable installation and management procedures" on page 96

Notes:

1. If you are installing the HPS in an IBM @server p5 server frame, that switch must be configured as a Node Switch Board (NSB) for server-to-switch communication. ISB configurations are not allowed in IBM @server p5 server frames.
2. There is a specific order for installing switches into a switch-only frame. You **must** refer to "Switch installation order for switch-only frames" on page 85 for additional information.
3. Some switch-only frame configurations require 24 inch frame extenders. Before you install switches into a switch-only frame, refer to "Installing 24 inch frame extenders" on page 80 for additional information.
4. If you are installing the HPS in a switch-only frame, you can configure the switch as either an Intermediate Switch Board (ISB) for switch-to-switch communication or as Node Switch Board (NSB) for server-to-switch communication.

Installing frames with an integral HPS

This section describes the installation procedure for new frames with preinstalled switches. These frames ship from the factory with most of the internal components in place. However, you will have to install the frame on the raised floor and connect the new hardware into the network. Since those tasks use the same procedures described for other installations, this section will direct you to other procedures for common tasks.

DANGER

Electrical voltage and current from power, telephone, and communication cables are hazardous.

To avoid a shock hazard:

- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**
- **Connect all power cords to a properly wired and grounded electrical outlet. Ensure outlet supplies proper voltage and phase rotation according to the system rating plate.**
- **Connect any equipment that will be attached to this product to properly wired outlets.**
- **When possible, use one hand only to connect or disconnect signal cables.**
- **Never turn on any equipment when there is evidence of fire, water, or structural damage.**
- **Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.**
- **Connect and disconnect cables as described below when installing, moving, or opening covers on this product or attached devices.**

  To Disconnect:

  1. **Turn everything OFF (unless instructed otherwise).**
  2. **Remove power cords from the outlet.**
  3. **Remove signal cables from connectors.**
  4. **Remove all cables from devices.**

  To Connect:

  1. **Turn everything OFF (unless instructed otherwise)**
  2. **Attach all cables to devices.**
  3. **Attach signal cables to connectors.**
  4. **Attach power cords to outlet.**
  5. **Turn device ON.**

  (D005)

To install a frame with one or more integral switches:

1. Refer to the appropriate installation instructions and install the HMC

   Note: As part of the HMC installation process, make sure that you review "Hardware Management Console" on page 58 for information about that part of the configuration process.
2. From the following list, perform the appropriate installation instructions:
   - If this is a switch-only frame, refer to "Installing switch-only frames" on page 71
   - If this is a server frame, refer to the appropriate installation information for the specific server type
3. Cable all switch port connector cards for switch-to-switch or server-to-switch connections, (refer to "Additional hardware installation tasks" on page 88 for cable management information and to the reference information in Appendix D, "Cabling the HPS," on page 337)

   Notes:

   a. For EMC compliance, you must maintain a minimum 25 mm (1 inch) clearance between switch cables and UPIC or other AC cables. Switch cables **must not touch** power cables.

   b. If the system has switch ports that do not require cables, you must install copper cable EMC port covers or fiber optic cable dust covers on those ports.

c. Make certain that the frame meets all the EMC shielding requirements specified in “Installing EMC shielding” on page 89.

4. *If required,* install the UPICs connecting the HPS to the frame Bulk Power, refer to:
   - “UPIC plugging locations for switches installed in switch-only frames” on page 144
   - “UPIC plugging locations for switches installed in p5-590 and p5-595 frames” on page 145
   - “UPIC plugging locations for switches installed in p5-575 frames” on page 145
5. Power on the customer wall breakers and turn on the EPO/Frame Power switch (Standby power)
6. Complete all tasks associated with firmware and software installation
   - Refer to “Firmware installation” on page 104 and “Software installation” on page 106 and return to this step after completing those procedures
7. IPL/Power on systems
8. Continue with “Post-installation tasks for switch hardware” on page 104

Installing an HPS into an existing server frame

Attention: In an IBM eServer p5 server frame, the HPS must be configured as a Node Switch Board (NSB). ISB configurations are not allowed in IBM eServer p5 server frames.

1. Identify switch placement location

   Note: Do not install UPICs until instructed to do so.
2. Perform switch installation:
   a. Attach the support rails to both side of the designated EIA position
   b. Install the HPS chassis assembly on the rails
   c. Tighten the hold down screws
   d. Install server SNIs, refer to the specific server documentation for installation instructions
   e. Refer to Appendix D, “Cabling the HPS,” on page 337 and cable all switch port connector cards for switch-to-switch or server-to-switch connections

      Note: If the system has switch ports that do not require cables, you must install copper cable EMC port covers or fiber optic cable dust covers on those ports.
3. Power off system and remove frame power using the UEPO switch
4. Install the UPICs connecting the HPS to the frame Bulk Power, refer to:
   - “UPIC plugging locations for switches installed in switch-only frames” on page 144
   - “UPIC plugging locations for switches installed in p5-590 and p5-595 frames” on page 145
   - “UPIC plugging locations for switches installed in p5-575 frames” on page 145

   Notes:
   a. For EMC compliance, you must maintain a minimum 25 mm (1 inch) clearance between switch cables and UPIC or other AC cables. Switch cables **must not touch** power cables.
   b. Make certain that the frame meets all the EMC shielding requirements specified in “Installing EMC shielding” on page 89.
5. Power on EPO/Frame Power switch (Standby power)
6. Complete all tasks associated with firmware and software installation
   - Refer to “Firmware installation” on page 104 and “Software installation” on page 106 and return to this step after completing those procedures
7. IPL/Power on systems
8. Continue with “Post-installation tasks for switch hardware” on page 104

Installing switch-only frames

Attention: Some switch-only frame configurations require frame extenders. These extenders must be installed before you install the switches. Refer to "Installing 24 inch frame extenders" on page 80 for additional information.

Attention: The installation procedure for switch-only frames requires that you install each switch into a specific rack position using a predetermined order. Refer to:
- "Switch installation order for switch-only frames" on page 85 for additional location information
- "Installing an HPS into an existing server frame" on page 70 for additional installation information

The HPS may be installed in a 24 inch powered expansion rack FC 5792/8691 configured as a switch-only frame. These frames use standard power supplies and may contain the optional Integrated Battery Features (IBF). You may install up to six switches if you install the IBF option in the frame and up to eight switches if you do not install the IBF option. Use the following procedure to complete these installations.

Note: Switches mounted in switch-frames may be configured as either Intermediate Switch Boards for switch-to-switch communication or Node Switch Boards for server-to-switch communication.

Step 1. Position and level the rack

Attention:
- An IBM designated delivery company will move all frames into position.
- In raised floor installations, mechanically safe moldings should be installed around floor cutouts. Extreme caution should be used when moving frames during installation or removal because of the proximity of floor cutouts to casters.

To adjust the leveler feet on the rack, do the following:
1. Ensure the rack is positioned according to the customer plan.
2. Loosen the jam nut on each leveler foot by turning the nut counterclockwise (away from the bottom of the rack).
3. Rotate each leveler foot downward until it contacts the surface on which the rack is placed.
4. Adjust the leveler feet downward as needed until the rack is level. When the rack is level, tighten the jam nuts against the base by turning the nut clockwise (toward the bottom of the rack).

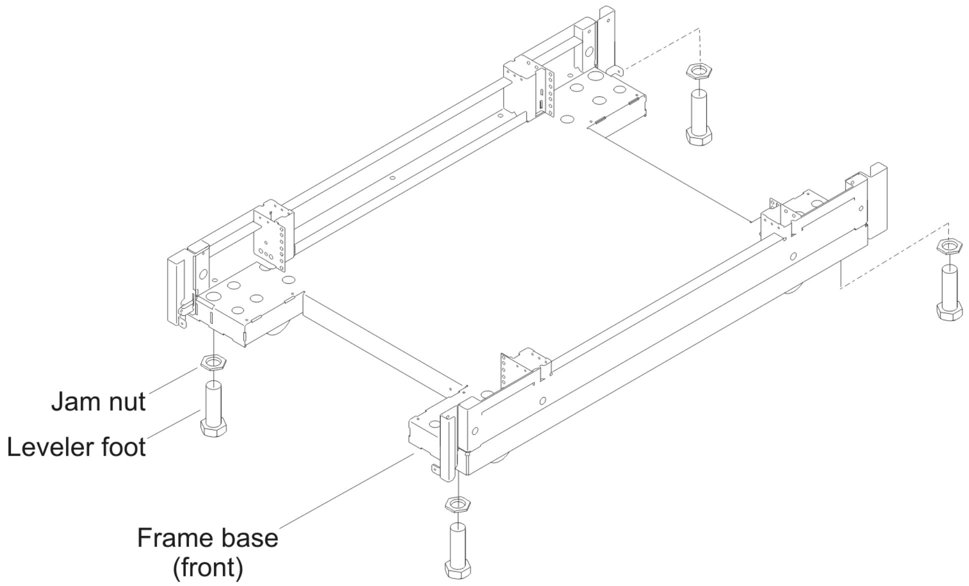


Figure 20. Frame leveling hardware

Step 2. Check cable attachment

Cables may loosen during shipping. Check for loose cables before continuing the installation. Reconnect any cables that are loose or disconnected.

Step 3. Verify that the Unit Emergency Power Off (UEPO) Switch is in the *Off* position

Note: *UEPO* refers to the red Unit Emergency Power Off switch located on the unit. *EPO* refers to the computer room Emergency Power off.

The unit emergency power off (UEPO) switch is located on the front of the system rack. When the switch is tripped, utility power is confined to the machine power compartment. All volatile data is lost.

Computer Room Emergency Power Off (EPO)

Attention: When the integrated battery feature (IBF) is installed and the room EPO is turned off, the batteries engage and the system continues to run. It is possible to attach the computer room EPO system to the machine UEPO. When this is done, turning off the room EPO disconnects all power from the power cords and the IBF unit. In this event, all volatile data is lost.

CAUTION:
The power-control button on the device does not turn off the electrical current supplied to the device. The device might also have more than one connection to dc power. To remove all electrical current from the device, ensure that all connections to dc power are disconnected at the dc power input terminals. (C031)

To incorporate the IBF into the room EPO, a cable connection must be made to connect to the rear of the system UEPO panel. The following diagrams illustrate how to make the connection.

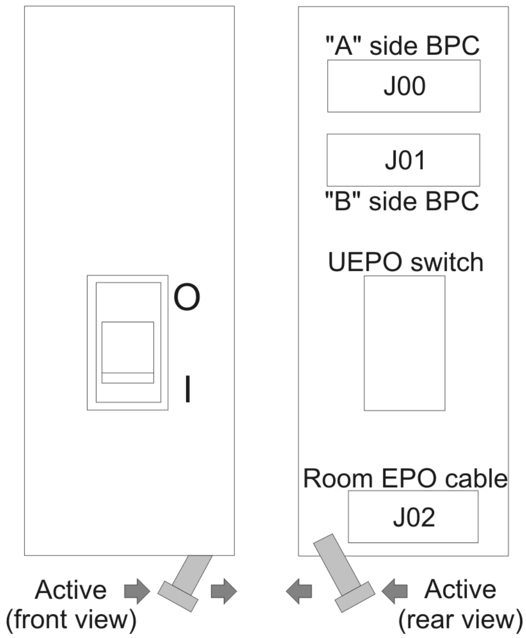


Figure 21. EPO cable connection

This illustration shows the rear of the machine UEPO panel with the room EPO cable plugging into the machine. The switch actuator located at the bottom of the UEPO must be switched to the ″active″ position. After the switch actuator is moved to ″active″ and makes the cable connection possible, the room EPO cable must be installed for the machine to power on.

The following illustration shows the AMP connector (part number 770019-1) needed to connect to the system UEPO panel. For room EPO cables using wire sizes #20 AWG to #24 AWG, use AMP pins (part number 770010-4).

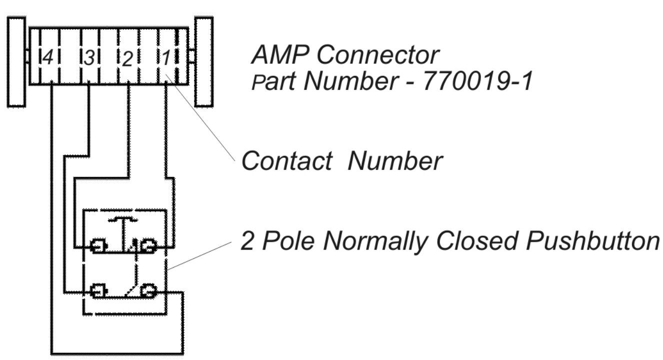


Figure 22. AMP connector

Step 4. Check power outlets and source

DANGER

Electrical voltage and current from power, telephone, and communication cables are hazardous.

To avoid a shock hazard:

- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**
- **Connect all power cords to a properly wired and grounded electrical outlet. Ensure outlet supplies proper voltage and phase rotation according to the system rating plate.**
- **Connect any equipment that will be attached to this product to properly wired outlets.**
- **When possible, use one hand only to connect or disconnect signal cables.**
- **Never turn on any equipment when there is evidence of fire, water, or structural damage.**
- **Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.**
- **Connect and disconnect cables as described below when installing, moving, or opening covers on this product or attached devices.**

  To Disconnect:

  1. **Turn everything OFF (unless instructed otherwise).**
  2. **Remove power cords from the outlet.**
  3. **Remove signal cables from connectors.**
  4. **Remove all cables from devices.**

  To Connect:

  1. **Turn everything OFF (unless instructed otherwise)**
  2. **Attach all cables to devices.**
  3. **Attach signal cables to connectors.**
  4. **Attach power cords to outlet.**
  5. **Turn device ON.**

  (D005)

DANGER

An electrical outlet that is not correctly wired could place hazardous voltage on the metal parts of the system or the devices that attach to the system. It is the responsibility of the customer to ensure that the outlet is correctly wired and grounded to prevent an electrical shock. (D004)

CAUTION:
Ensure the building power circuit breakers are turned off *BEFORE* you connect the power cord(s) to the building power. (C023)

To ensure that the customer has provided the correct power to the system, do the following:

1. This system is equipped to use 200-240 V ac, 380-415 V ac, or 480 V ac, three-phase power. Check that the correct power source is available.
2. Have the customer locate and turn off the branch circuit breaker and attach tag S229-0237, which reads “Do Not Operate.”

Note: All measurements are made with the receptacle faceplate in the normally installed position.

3. Some receptacles are enclosed in metal housings. On receptacles of this type, perform the following steps:
   a. Check for less than 1 volt from the receptacle case to any grounded metal structure in the building, such as a raised-floor metal structure, water pipe, building steel, or similar structure.
   b. Check for less than 1 volt from receptacle ground pin to a grounded point in the building.

   Note: If the receptacle case or faceplate is painted, be sure the probe tip penetrates the paint and makes good electrical contact with the metal.
4. Check the resistance from the ground pin of the receptacle to the receptacle case. Check resistance from the ground pin to building ground. The reading should be less than 1.0 ohm, which indicates the presence of a continuous grounding conductor.

   Note: If measured impedance is greater that 1 ohm and the test instrument used was a digital multimeter, verify that the grounding impedance is correct by using an appropriately approved ground-impedance tester.
5. If any of the checks made in sub-steps 2, 3, and 4 are not correct, ask the customer to remove the power from the branch circuit and make the wiring corrections; then check the receptacle again.
6. Check for infinite resistance between the phase pins. This is a check for a wiring short.

   Note: If the reading is other than infinity, do not proceed. Have the customer make necessary wiring connections before continuing. Do not turn on the circuit breaker for the branch circuit until all the above steps are satisfactorily completed.
7. Have the customer remove tag S229-0237, which reads “Do Not Operate” and turn on the branch circuit breaker.

   Note: If your power source does not have a standard receptacle, check for voltage using local procedures.
   Measure for appropriate voltages between phases. If no voltage is present on the receptacle case or grounded pin, the receptacle is safe to touch.
8. With an appropriate meter, verify that the voltage at the outlet is correct:
   - For 200-240 V, the acceptable phase-phase voltage measurement range is 180-254 V.
   - For 380-415 V, the acceptable phase-phase voltage measurement range is 342-440 V.
   - For 480 V, the acceptable phase-phase voltage measurement range is 432-509 V.
9. Verify that the grounding impedance is correct by using the ECOS 1020, 1023, B7106, or an appropriately approved ground impedance tester.
10. Have the customer turn off the branch circuit breaker and attach tag S229-0237, which reads “Do Not Operate.”

Step 5. Connect the Hardware Management Console (HMC)

Attention: The information provides specific information for connecting the HMC to a Cluster 1600 system. For general HMC installation instructions, use the information provided in *IBM Hardware Management Console for pSeries Installation and Operations Guide*.

The Hardware Management Console (HMC) user interface provides the functions needed to control power to frame subsystems, manage frame resources, and create and maintain multiple-partitioned environments in the processor subsystems in the rack. To enable these functions, you must assign specific HMCs to specific frames.

CSM provides software assistance with these tasks through the Cluster-Ready Hardware Server (CRHS) software. CRHS provides a central access point on the Management Server for all HMCs. Refer to “Cluster-Ready Hardware Server” on page 57 for additional information.

Note: During the HMC code load procedure, you will use the HMC GUI to set the frame numbers for the cluster. Depending on server type, refer to “Firmware installation” on page 104 for additional information.

Connect the HMC to the system

DANGER

Electrical voltage and current from power, telephone, and communication cables are hazardous.

To avoid a shock hazard:

- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**
- **Connect all power cords to a properly wired and grounded electrical outlet. Ensure outlet supplies proper voltage and phase rotation according to the system rating plate.**
- **Connect any equipment that will be attached to this product to properly wired outlets.**
- **When possible, use one hand only to connect or disconnect signal cables.**
- **Never turn on any equipment when there is evidence of fire, water, or structural damage.**
- **Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.**
- **Connect and disconnect cables as described below when installing, moving, or opening covers on this product or attached devices.**

  To Disconnect:

  1. **Turn everything OFF (unless instructed otherwise).**
  2. **Remove power cords from the outlet.**
  3. **Remove signal cables from connectors.**
  4. **Remove all cables from devices.**

  To Connect:

  1. **Turn everything OFF (unless instructed otherwise)**
  2. **Attach all cables to devices.**
  3. **Attach signal cables to connectors.**
  4. **Attach power cords to outlet.**
  5. **Turn device ON.**

  (D005)

In general, each HMC requires an Ethernet connection to the cluster service network using the eth0 port on the HMC. Using the cluster service network, the HMC connects to the servers through the Ethernet connection on the frame BPC. In addition, communication with the Management Server uses the ethX port on that component. Figure 23 on page 77 shows a high level view of a simple, non-redundant cluster service network. “Connecting the cluster service network” on page 54 provides additional information on configuring either a non-redundant or a redundant cluster service network.

Notes:

1. Since each HMC model uses different ports as eth0, you must refer to the installation documentation for each HMC when making the service network connection.
2. The customer is responsible for providing the Ethernet cable for the cluster service network.
3. Before you connect any network cables, **make certain** that you have followed the "Cable installation and management procedures" on page 96. Failure to follow this procedure may damage network components.

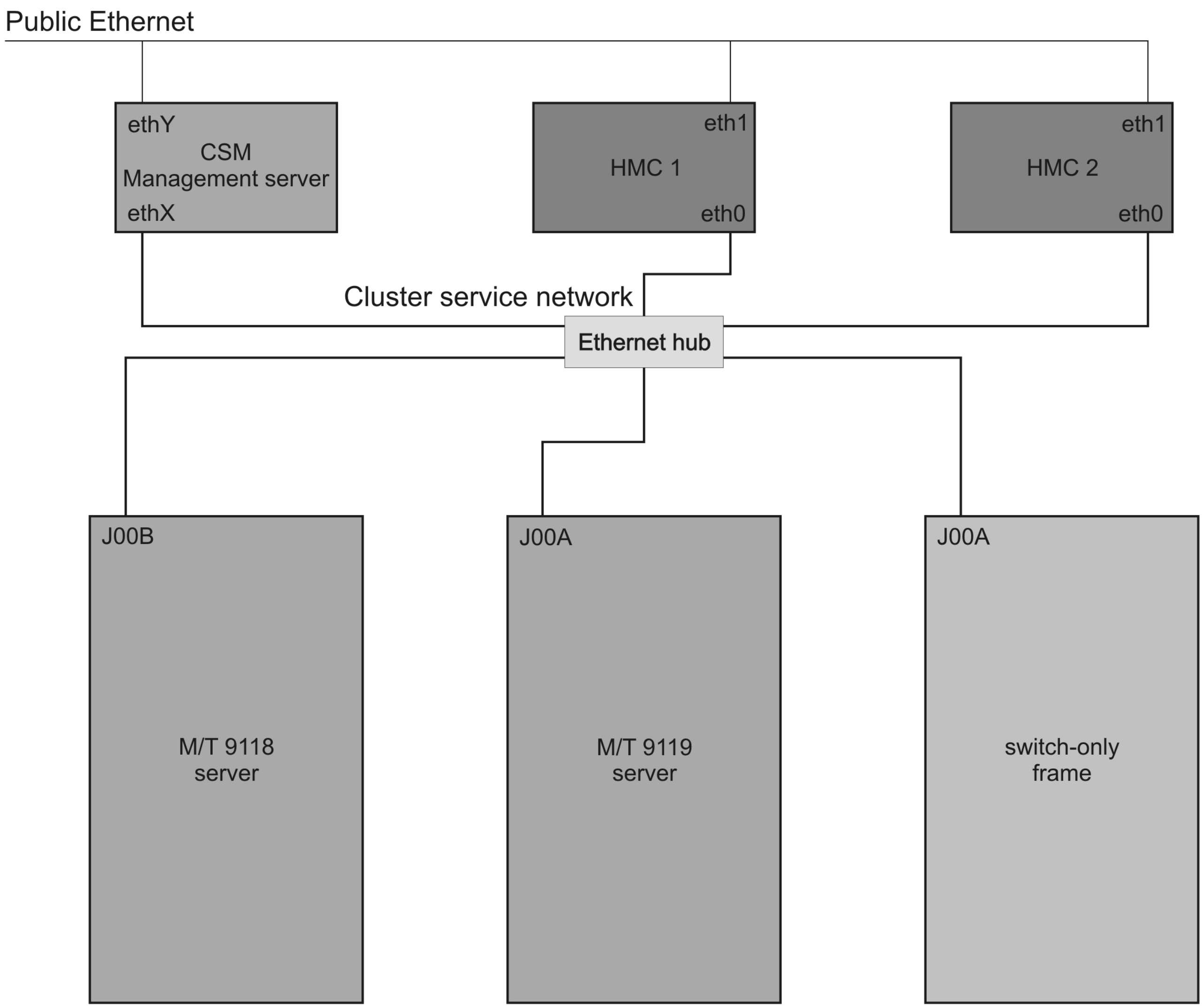


Figure 23. HMC-to-server Ethernet connections for a non-redundant cluster service network.

Note: Refer to "Cluster service network" on page 51 for information about redundant cluster service networks.

Connect the external modem

The external modem is used in conjunction with the HMC's Service Agent and Call Home features. To install the external modem, refer to the *IBM Hardware Management Console for pSeries Installation and Operations Guide*.

Note: You can also configure a VPN Internet connection to support the Call Home feature.

Connect the HMC power cord

1. Connect the HMC power cord into the power receptacle on the rear of the HMC.
2. Plug the power cords for the display, HMC, and modem (if applicable) into electrical outlets.

Step 6. Route and connect power cords to the system

The rack system has two power cords, one located on the front and one on the rear of the rack. These two power cords attach to the Bulk Power Assemblies (BPAs), are routed on the left side of the rack (at the front and rear of the rack), and connect to an electrical power source.

The following illustration shows the power cord routing in the rack.

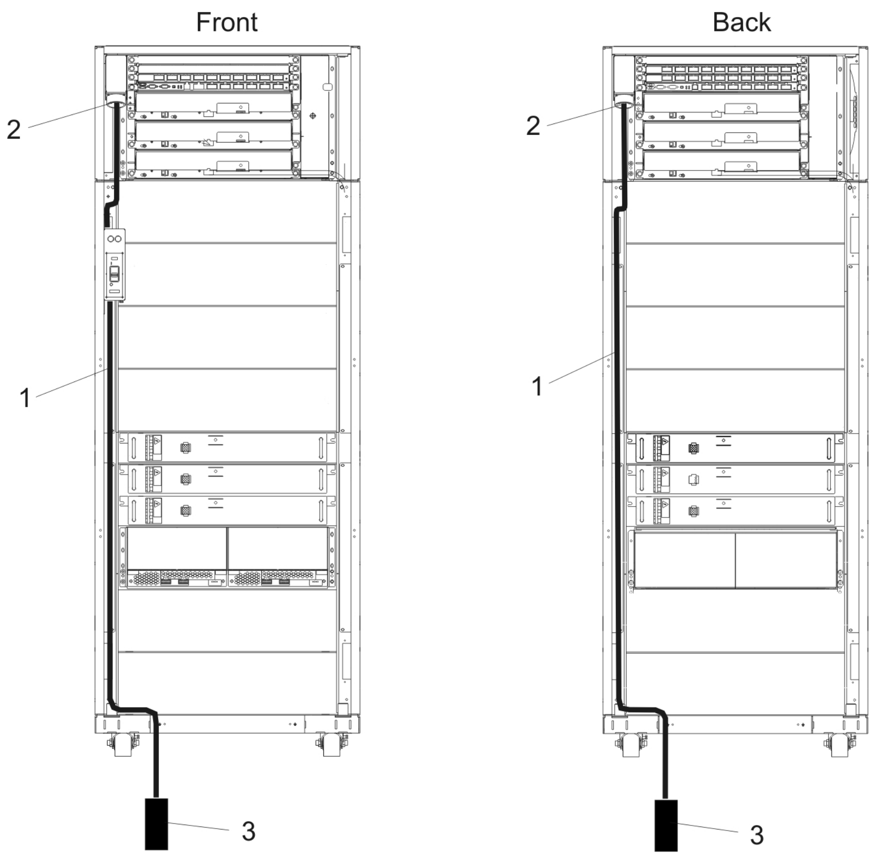


Figure 24. Frame power routing.

Table 16. Frame power components

Number	Components
1	Power cord
2	Power cord connection at BPA
3	Electrical power source connection

To route and connect the power cords, do the following:

1. Loosen or remove the cable retainers and filler plate located along the side and bottom of the frame. To identify the use of the brackets, filler plates, and cable ties for the rack, refer to Table 17 on page 79.

Table 17. Using cable retention brackets and filler plates

Description	Recommended Usage
Cable retention bracket	Use in the base of the frame to retain cables leaving the frame. This bracket is used for large diameter cables.
Cable retention bracket	Use in the base of the frame to retain the cables leaving the frame. This bracket is used for medium diameter cables.
Cable retention bracket	Use in the base of the frame to retain the cables leaving the frame. This bracket is used for small diameter cables.
Filler plate (thin)	Use in the base of the frame to cover the openings. Install in the base of the frame after all of the cable retention brackets are installed.
Filler plate (wide)	Use in the base of the frame to cover openings. Install in the base of the frame after all of the cable retention brackets are installed.
Soft cable ties (roll)	Use to organize the cables leaving frame.

2. On the front of the frame, loosen the screw on the brackets in the cable track on the left side only. Remove the UEPO switch.
3. Remove the toolbox from the bottom of the frame.
4. Route the power cords underneath the frame to the floor tile holes. For more information about floor cutouts, refer to “Floor plans” on page 298 and to *eServer pSeries Site and Hardware Planning Information* SA38-0508.

   Note: Route the power cords for frames with EMC skirts installed through the cutout section in the EMC skirt.
5. Route and secure the power cords in the frame channel, with the brackets from top to bottom.
6. Connect the plugs for the cords to the BPA.
7. Ensure that the dots are aligned on the cord plug and receptacle.
8. Replace the UEPO switch on the front of the frame.
9. Replace the toolbox in the bottom of the frame.

Step 7. Plug in the power cords

DANGER

An electrical outlet that is not correctly wired could place hazardous voltage on the metal parts of the system or the devices that attach to the system. It is the responsibility of the customer to ensure that the outlet is correctly wired and grounded to prevent an electrical shock. (D004)

CAUTION:
This product is equipped with a 4-wire (three-phase and ground) power cable. Use this power cable with a properly grounded electrical outlet to avoid electrical shock. (C019)

CAUTION:
Ensure the building power circuit breakers are turned off *BEFORE* you connect the power cord(s) to the building power. (C023)

Plug in the power cords from the rack to the electrical power source.

Step 8. Turn on the IBF breaker (if present)

Turn on the Integrated Battery Feature (IBF) breaker.

Step 9. Have the customer activate the designated circuit breakers

Have the customer activate the designated circuit breakers by doing the following:

1. Ensure that the tag S229-0237, which reads “Do Not Operate,” has been removed.
2. Reset the circuit breaker.

   Note: The following steps should be performed only by the service representative.
3. Turn the UEPO switch to the `ON` position.
4. Verify that the LEDs on the bulk power enclosure are on. The labels on the LEDs are as follows:
   - BPC - good
   - BPD - good
   - Power
   - Complete
   - Standby (flashes, then lights on solid)
   - BPR enabled
   - Power-in on processor subsystems

Step 10. Install firmware and software

Refer to “Firmware installation” on page 104 and “Software installation” on page 106 and return to this step after completing all tasks associated with those procedures.

Notes:
1. Switch-only frames do not require GFW server code. Only HMC and power code updates are required.
2. HMC code may have been loaded as part of a previous server installation. However, you must make certain that all HMCs have the correct code for cluster service.

Step 11. Install switch cables

Go to Appendix D, “Cabling the HPS,” on page 337 and cable all switch port connector cards for switch-to-switch or server-to-switch connections. In addition, refer to “Additional hardware installation tasks” on page 88 for cable management procedures.

Notes:
1. For EMC compliance, you must maintain a minimum 25 mm (1 inch) clearance between switch cables and UPIC or other AC cables. Switch cables **must not touch** power cables.
2. If the system has switch ports that do not require cables, you must install copper cable EMC port covers or fiber optic cable dust covers on those ports.
3. Make certain that the frame meets all the EMC shielding requirements specified in “Installing EMC shielding” on page 89.

Step 12. Complete all post-installation tasks

Refer to “Post-installation tasks for switch hardware” on page 104 for additional information.

Installing 24 inch frame extenders: The HPS switch-only frame (24 inch powered expansion rack FC 5792/8691) is delivered with an eight inch extender installed. The eight inch extender can accommodate up to two High Performance Switches and their associated switch cables. If you are going to configure more than two switches into the frame, the increased cable load requires a twenty-four inch extender. Before you can install the twenty-four inch extender, the eight inch extender must be removed. This section describes the procedures for those modifications.

Removing eight inch frame extenders: Part numbers for all major components used in this procedure are listed in the Parts Catalog under “Frame covers for standard switch-only frames” on page 216 and “Frame components (8 inch extenders) and cable management brackets for standard frames” on page 218.

1. At the rear of the frame, remove and retain the cover

2. Remove the two cover hinges (top and bottom on right side of frame) and one cover latch (middle left side of frame) by removing the screws. Retain all hardware.
3. Remove and discard the existing top extender by removing the two screws (refer to 1 in Figure 25 on page 82)
4. Remove and discard the existing left side extender by removing the three screws (refer to 2 in Figure 25 on page 82)
5. Remove and discard the existing right side extender by removing the three screws (refer to 3 in Figure 25 on page 82)
6. If not already done, remove the tile from the raised floor where you will install the twenty-four inch frame extender and replace it with a tile that has been modified as specified in “Floor tile cutouts for extended frames” on page 302

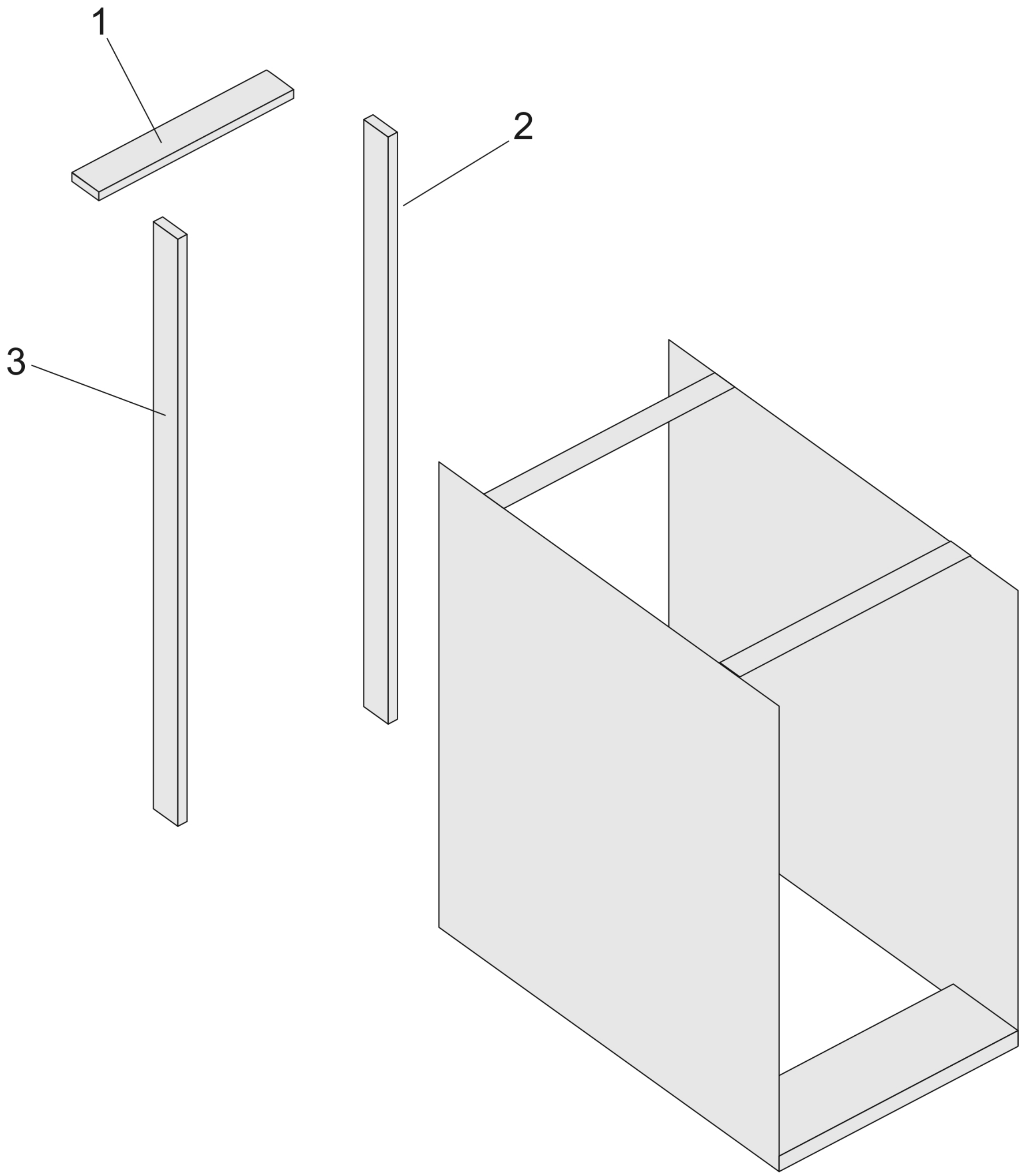


Figure 25. Removing the eight inch frame extender

Installing twenty-four inch frame extenders: When you install EMC skirts on a frame, route the frame power cords through the cutout section in the EMC skirt. However, for EMC compliance, you must maintain a minimum 25 mm (1 inch) clearance between switch cables and UPIC or other AC cables. Switch cables **must not touch** power cables.

Note: "Frame extender (24 inch), EMC skirts, and cable retainers" on page 222 lists the part numbers for the components described in this procedure.

1. If not present, install back EMC skirt to bottom center of frame using two self tapping screws
   - Refer to 1 in Figure 26 on page 85
2. Slide left corner EMC skirt onto tab on back skirt
   - Refer to 2 in Figure 26 on page 85

3. Slide right corner EMC skirt onto tab on back skirt
   - Refer to 3 in Figure 26 on page 85
4. Install cable retainer to bottom center of frame using two self tapping screws
   - Refer to 4 in Figure 26 on page 85
5. Install leveling foot on left side frame extender
6. Install leveling foot on right side frame extender
7. Install left side frame extender to existing frame using three (PN 1624803) screws
   - Refer to 5 in Figure 26 on page 85

CAUTION:

or

The weight of this part or unit is between 18 and 32 kg (39.7 and 70.5 lb.). It takes two persons to safely lift this part or unit. (C009)

8. Install right side frame extender to existing frame using three (PN 1624803) screws
   - Refer to 6 in Figure 26 on page 85

CAUTION:

or

The weight of this part or unit is between 18 and 32 kg (39.7 and 70.5 lb.). It takes two persons to safely lift this part or unit. (C009)

9. Install top frame extender to left and right side frame extenders using four (m5 X 16) screws
   - Refer to 7 in Figure 26 on page 85

10. Install bottom frame extender to cable retainer using two (m5 X 16) screws
    - Refer to 8 in Figure 26 on page 85
11. Install front EMC skirt to bottom frame extender using two (m5 X 16) screws
    - Refer to 9 in Figure 26 on page 85
12. Install left side EMC skirt to left side frame extender using two (m5 X 16) screws
    - Refer to 10 in Figure 26 on page 85
13. Attach left side EMC skirt to left corner EMC skirt using (m5 X 16) screw
    - Refer to 2 and 10 in Figure 26 on page 85
14. Attach left side EMC skirt to front EMC skirt (bottom hole) using screw (m5 X 16)
    - Refer to 10 and 9 in Figure 26 on page 85
15. Attach front EMC skirt (top hole) to left side frame extender using screw (m5 X 16)
    - Refer to 9 and 5 in Figure 26 on page 85
16. Install right side EMC skirt to right side frame extender using two screws (m5 X 16)
    - Refer to 11 and 6 in Figure 26 on page 85
17. Attach right side EMC skirt to right corner EMC skirt using screw (m5 X 16)
    - Refer to 11 and 3 in Figure 26 on page 85
18. Attach right side EMC skirt to front EMC skirt (bottom hole) using screw (m5 X 16)
    - Refer to 11 and 9 in Figure 26 on page 85
19. Attach front EMC skirt (top hole) to right side frame extender using screw (m5 X 16)
    - Refer to 9 and 6 in Figure 26 on page 85
20. Reinstall cover latch to left side frame extender using screws previously removed
    - Refer to 12 in Figure 26 on page 85
21. Reinstall the two cover hinges to right side frame extender using screws previously removed
    - Refer to 13 in Figure 26 on page 85
22. Adjust the two leveling pads as needed
23. Reinstall the rear cover
    - Refer to 14 in Figure 26 on page 85
24. Install the appropriate EMC gaskets
    - Refer to “Installing EMC gaskets on p5-575 server frames” on page 92

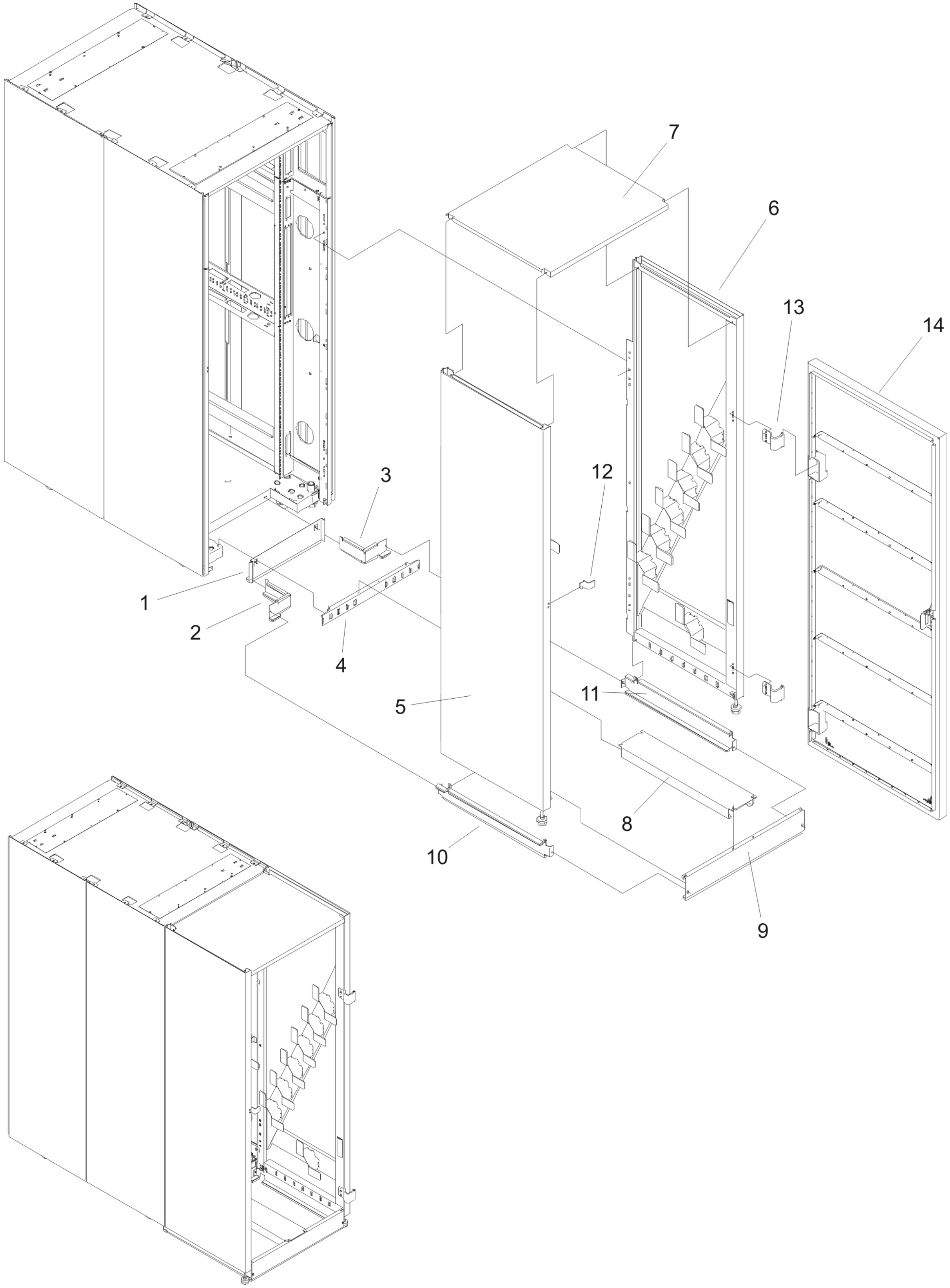


Figure 26. 24 inch powered expansion rack FC 5792/8691 frame with twenty-four inch extender

Switch installation order for switch-only frames:

Note: This section has information on installing switches into a switch-only frame. For information on installing switch cables, refer to Appendix D, “Cabling the HPS,” on page 337.

Switch-only frames may be installed as a single frame or as a two frame system. Use single frames for small network configurations (refer to “Standard switch configurations” on page 319). Larger configurations require a two frame system. In a two frame system, the second frame uses the power supply in the first frame and does not require an additional power subsystem. In this configuration, the frame with the power supply is called the Primary frame and the accessory frame is the Secondary frame. When viewed from the front of the frame, the Primary frame is on the right and the Secondary frame is on the left.

When you are installing switches in switch-only frames, you must install switches in a specific order. The installation order depends on whether the frames are equipped with the optional Integrated Battery Feature (IBF). Refer to:

- Figure 27 on page 87 for switch installation order in frames with the IBF option
- Figure 28 on page 88 for switch installation order in frames without the IBF option

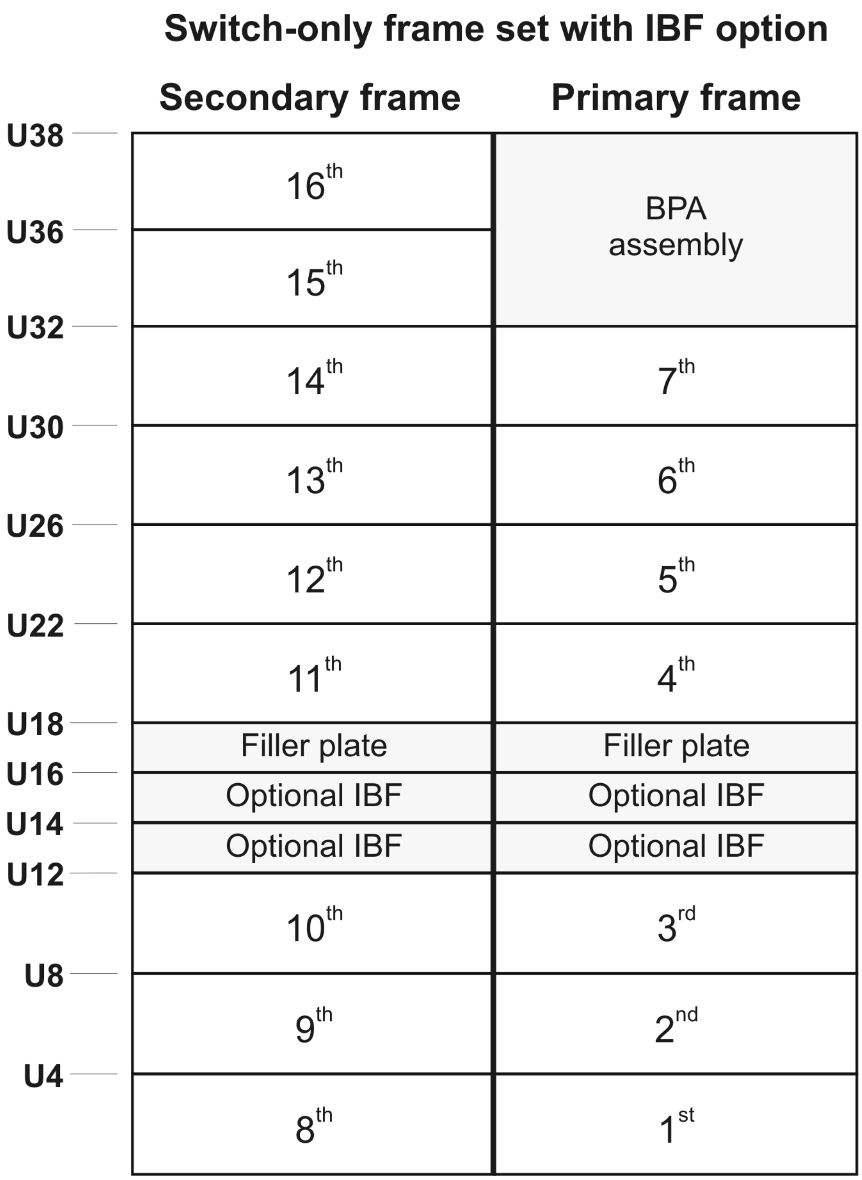


Figure 27. Switch installation order for switch-only frames with IBF

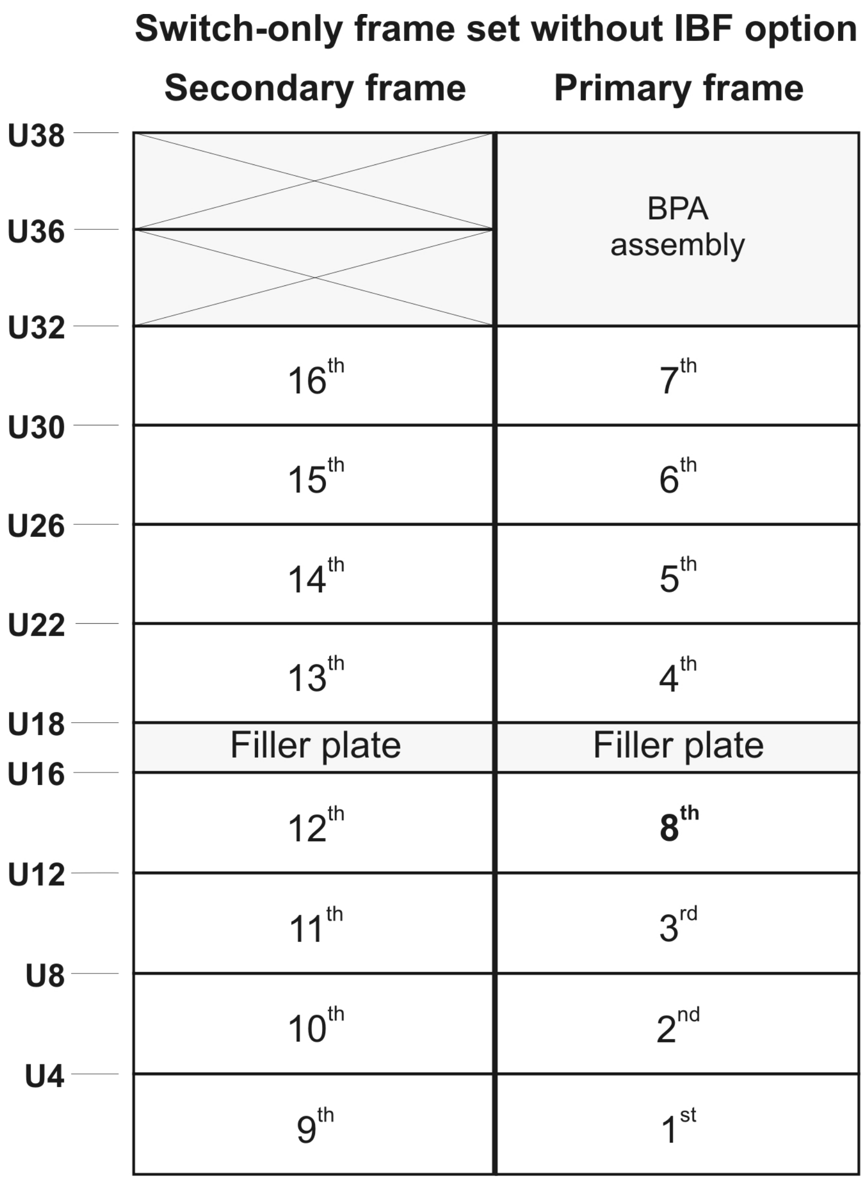


Figure 28. Switch installation order for switch-only frames without IBF

Additional hardware installation tasks

SNI and UPIC installation

After the HMC code upgrade is complete:

1. If necessary, finish installing the HPS
2. Shutdown any running operating systems and partitions
   - You **must** refer to and follow the procedures described in “Managed system power on and power off (LPAR reboot)” on page 159
3. Power off the systems from the HMC GUI:
   a. Select ″Server and Partition″
   b. Select ″Server Management″
   c. Select the appropriate power options

4. Wait for the managed systems to display ″No Power″ and ″OK″
5. Turn off the UEPO switch on any frames to be updated
6. Install SNIs as required
7. Route and connect the UPICs from the switch to the proper BPC and BPD locations
   - For information about UPIC connection points, refer to:
     – “UPIC plugging locations for switches installed in switch-only frames” on page 144
     – “UPIC plugging locations for switches installed in p5-590 and p5-595 frames” on page 145
     – “UPIC plugging locations for switches installed in p5-575 frames” on page 145

   Note: For EMC compliance, you must maintain a minimum 25 mm (1 inch) clearance between switch cables and UPIC or other AC cables. Switch cables **must not touch** power cables.
8. Route and connect the switch cables to the designated ports on the SPC cards and the associated ports on the SNIs
   - For switch cable connection locations, refer to the switch cable planning documentation created by the customer
   - For additional information about determining switch cable connection points, refer to Appendix C, “HPS network configuration,” on page 305 and Appendix D, “Cabling the HPS,” on page 337

Installing EMC shielding

Any frame connected to a HPS **must** have EMC skirts installed. This includes server frames and switch-only frames. In addition to the EMC skirts, p5-575, p5-590, and p5-595 server frames with acoustic covers require EMC gaskets. Depending on frame type, the installation procedures are described in the following sections:
- “EMC shielding for M/T 9119-590 and M/T 9119-595 frames”
- “EMC shielding for p5-575 server frames” on page 91
- “EMC shielding for standard 24 inch powered expansion rack FC 5792/8691 frames” on page 94

EMC shielding for M/T 9119-590 and M/T 9119-595 frames: This section describes the procedures for installing EMC shielding on p5-590 and p5-595 server frames. EMC shielding for these servers includes:
- EMC skirts required on all server frames
- EMC gaskets required on all server frames with acoustical covers

Note: You must install EMC shielding on any frame connected to a HPS network.

Installing EMC skirts on p5-590 and p5-595 server frames:

Notes:
1. When you install EMC skirts on a frame, route the frame power cords through the cutout section in the EMC skirt.
2. If an I/O expansion frame is attached to the M/T 9119-590 or M/T 9119-595 base frame, an additional EMC skirt set must be installed on the expansion frame.

All M/T 9119-590 and M/T 9119-595 frames connected to a HPS must have EMC skirts installed at the base of the frame. This procedure describes EMC skirt installation:
1. At the front bottom of frame, install rear skirt by sliding into place under frame (refer to 1 in Figure 29 on page 90)
2. Attach left side skirt to rear skirt by using (m5 X 16) screw (refer to 2 in Figure 29 on page 90)
3. Attach right side skirt to rear skirt by using (m5 X 16) screw (refer to 2 in Figure 29 on page 90)
4. Install cable retainer to front bottom cutout using existing self tapping screws (refer to 3 in Figure 29 on page 90)
5. Attach front skirt to bottom of frame using two (m5 X 16) screws (refer to 4 in Figure 29 on page 90)

6. Attach front skirt to left and right side skirts using (m5 X 16) screws (refer to 2 and 4 in Figure 29)

Note: “EMC shielding for standard server frames” on page 230 lists the part numbers for the components described in this procedure.

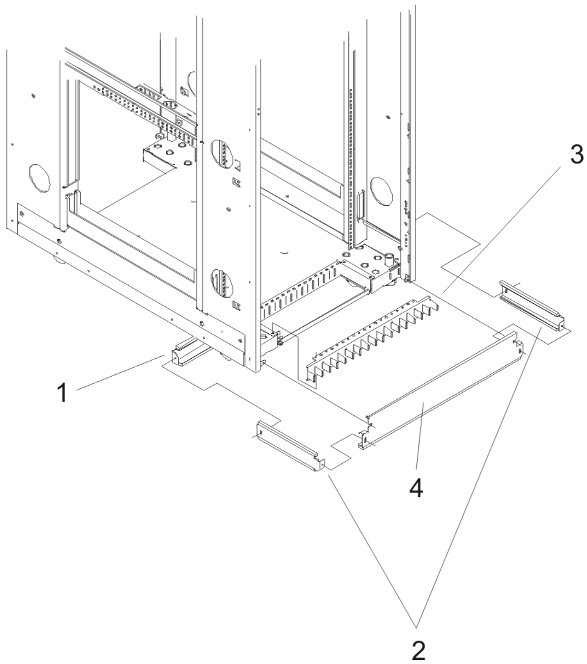


Figure 29. EMC skirt for M/T 9119-590 and M/T 9119-595 frames

Installing EMC gaskets on p5-590 and p5-595 server frames: In addition to EMC skirts, if a M/T 9119-590 or M/T 9119-595 (p5-590 or p5-595) server frame has acoustic covers and the frame is connected to a HPS, then that frame also requires EMC gaskets on the rear door hinges. The EMC gasket kit (P/N 16R0921) contains the required parts for this installation. Use the following procedure to install the hinge gaskets (refer to Detail A on Figure 30 on page 91):

1. Locate both hinge gasket profiles in the parts kit
2. Remove the paper liner from one profile and expose the gasket adhesive
3. Align shorter leg of the gasket with edge of hex pattern and upper edge of opening
4. Press short leg of gasket in place
5. Pinch the middle of the gasket to create a raised area at the hinge bend area
6. Wrap the remaining leg of the gasket into the hinge opening and press in place
7. Repeat the procedure and install the gasket for the second hinge

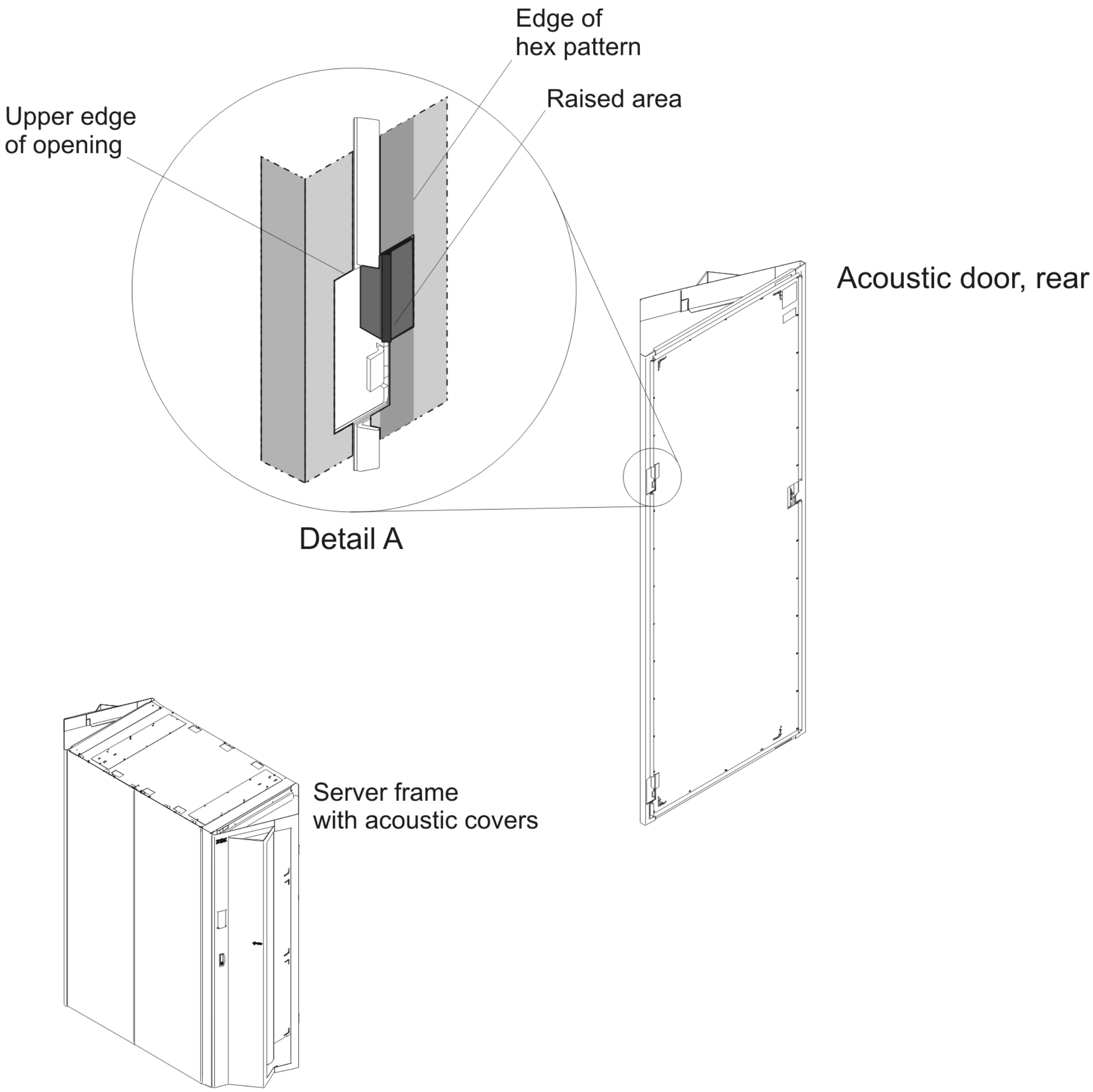


Figure 30. Acoustic door EMC gasket locations for p5-590 and p5-595 server frames

EMC shielding for p5-575 server frames: You must install EMC shielding on any frame connected to a HPS network. This section describes the procedures for installing EMC shielding on p5-575 server frames. EMC shielding includes:

- EMC skirts required on all server frames
- EMC gaskets required on all server frames with acoustical covers

Notes:

1. If the server frame has an expansion frame attached to the base frame, an additional EMC skirt set must be installed on the expansion frame.
2. "EMC shielding for standard server frames" on page 230 lists the part numbers for the components described in this procedure.
3. When you install EMC skirts on a frame, route the frame power cords through the cutout section in the EMC skirt.

Installing EMC skirts on p5-575 server frames: **All** p5-575 server frames connected to a HPS must have EMC skirts installed at the base of the frame. Use the following procedure for EMC skirt installation:

1. At the front bottom of frame, install the rear skirt by sliding it into place under the frame. (refer to 1 in Figure 31)
2. Attach left side skirt to rear skirt using (m5 X 16) screw (refer to 2 in Figure 31)
3. Attach right side skirt to rear skirt using (m5 X 16) screw (refer to 4 in Figure 31)
4. Attach front skirt (top hole) to bottom of frame using two (m5 X 16) screws (refer to 3 in Figure 31)
5. Attach front skirt (bottom hole) to left and right side skirts using (m5 X 16) screws (refer to 2, 3, and 4 in Figure 31)

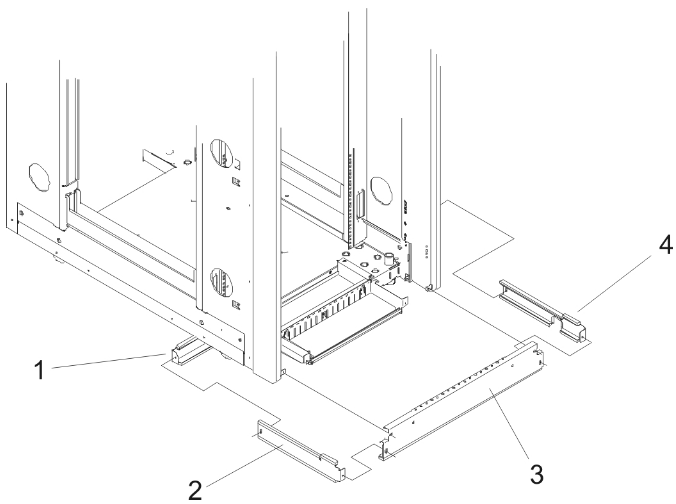


Figure 31. EMC skirt for p5-575 server frames

Installing EMC gaskets on p5-575 server frames: In addition to EMC skirts, if the p5-575 frame has acoustic covers and the frame is connected to a HPS, then that frame also requires EMC gaskets on the rear door and its latch. The EMC gasket kit (P/N 16R0921) contains the required parts for this installation. Use the following procedures to install these gaskets:

1. Install hinge gaskets on rear door (refer to Detail A on Figure 32 on page 93)
   a. Locate both hinge gasket profiles in the parts kit
   b. Remove the paper liner from one profile and expose the gasket adhesive
   c. Align shorter leg of the gasket with edge of hex pattern and upper edge of opening
   d. Press short leg of gasket in place
   e. Pinch the middle of the gasket to create a raised area at the hinge bend area
   f. Wrap the remaining leg of the gasket into the hinge opening and press in place
   g. Repeat the procedure and install the gasket for the second hinge
2. Install latch gaskets on rear door (refer to Detail B on Figure 32 on page 93)
   a. Locate gasket profile in the parts kit
   b. Remove paper liner to expose gasket adhesive
   c. Position gasket behind opening as shown in Detail B
      - Leave approximately 15 mm exposed
   d. Press gasket in place
3. Install latch gaskets on frame (refer to Detail C on Figure 33 on page 94)
   a. Locate gasket profile in the parts kit
   b. Remove paper liner to expose gasket adhesive
   c. Align the step of the gasket with the edge of the latch
   d. Press gasket in place

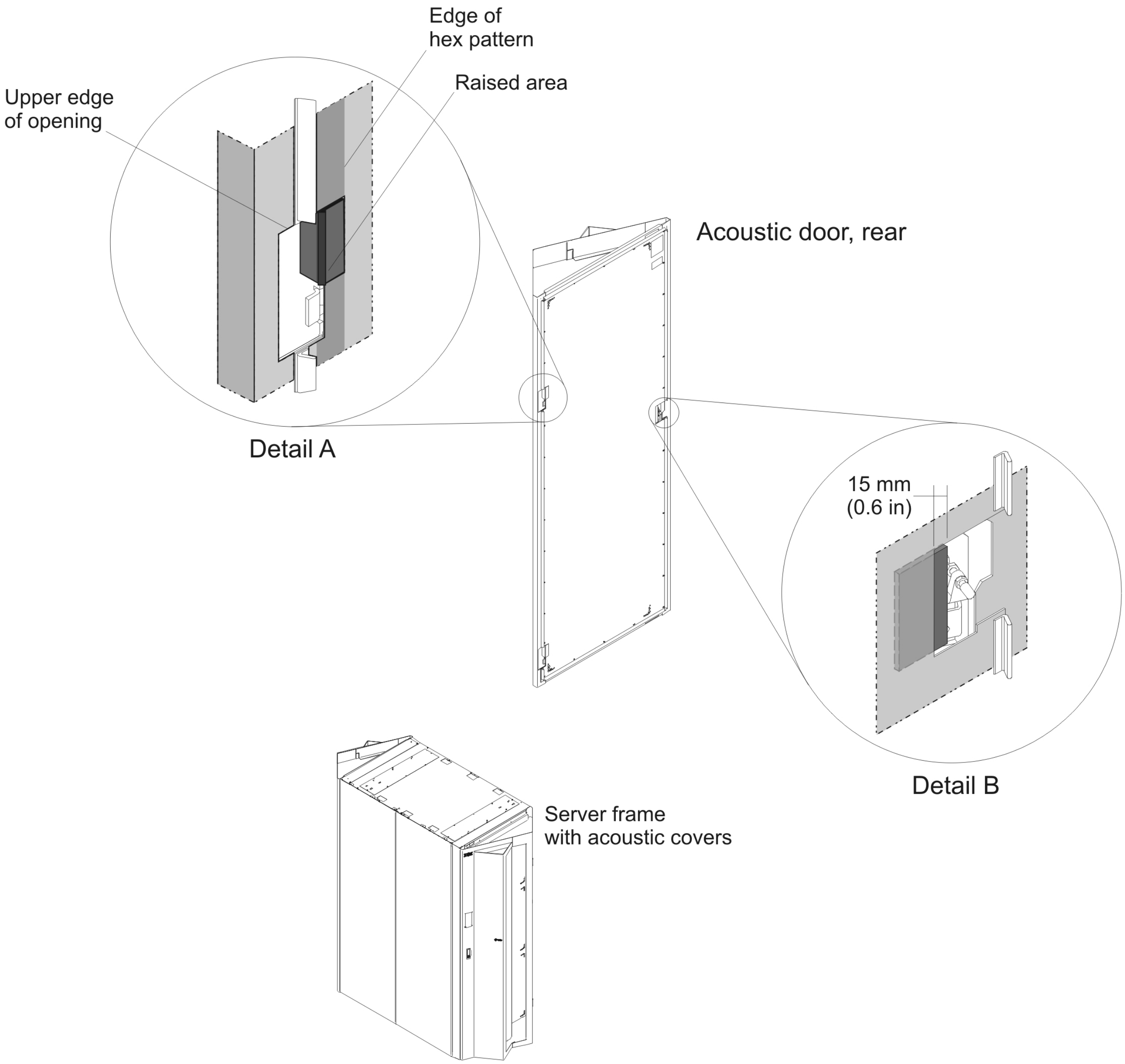


Figure 32. Acoustic door EMC gasket locations for p5-575 server frames

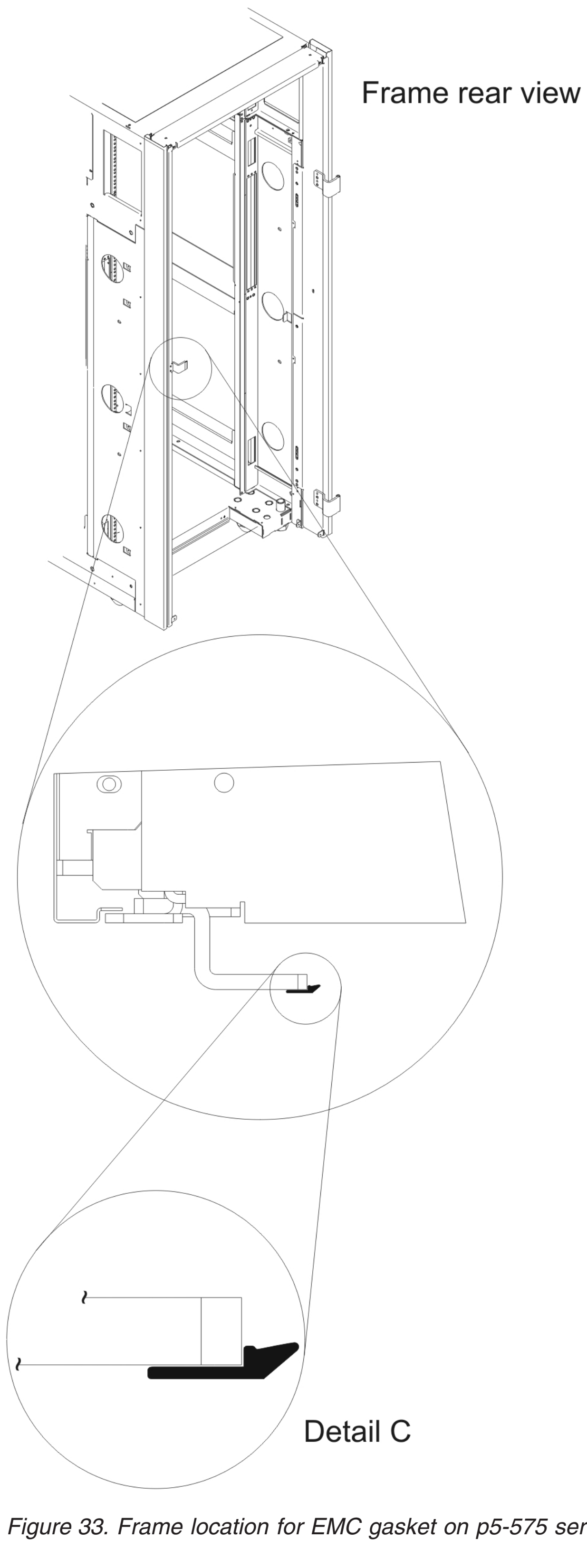


Figure 33. Frame location for EMC gasket on p5-575 server frames with acoustic covers

EMC shielding for standard 24 inch powered expansion rack FC 5792/8691 frames: This section describes the procedures for installing EMC shielding on 24 inch powered expansion rack FC 5792/8691 switch-only frames:

Note: For information on installing EMC skirts on 24 inch powered expansion rack FC 5792/8691 **extended** frames, refer to “Installing twenty-four inch frame extenders” on page 82.

Installing EMC skirts on switch-only frames: This section describes the installation procedure for the required EMC skirts on *standard* HPS switch-only frames.

Notes:

1. For information on installing EMC skirts on *extended* switch-only frames, refer to “Installing twenty-four inch frame extenders” on page 82.
2. For information on installing EMC skirts on 24 inch powered expansion rack FC 5792/8691 *server* frames, refer to “EMC shielding for p5-575 server frames” on page 91.
3. “EMC skirts for standard switch-only frames” on page 220 lists the part numbers for the components described in this procedure.
4. When you install EMC skirts on a frame, route the frame power cords through the cutout section in the EMC skirt.

All switch-only frames must have EMC skirts installed at the base of the frame. Use the following procedure for EMC skirt installation on standard 24 inch powered expansion rack FC 5792/8691 frames configured for switch-only applications:

1. Slide the rear skirt into position in the cutout at the rear of the frame (refer to 2 in Figure 34 on page 96)
2. Attach the rear skirt using two self tapping screws
3. If applicable, move the switch cables into position before installing the front skirt
   - You also have the option of positioning the switch cables after the EMC skirt is completely installed
4. Slide the front skirt into position at the rear of the frame (refer to 1 in Figure 34 on page 96)
5. Align the slots on the face of the front skirt with the corresponding frame locations and loosely attach the front skirt using two (m5 X 16) screws
6. Align the four holes on the top of the front EMC skirt with the corresponding frame locations and install four self tapping screws
7. Finish tightening all screws on the front EMC skirt

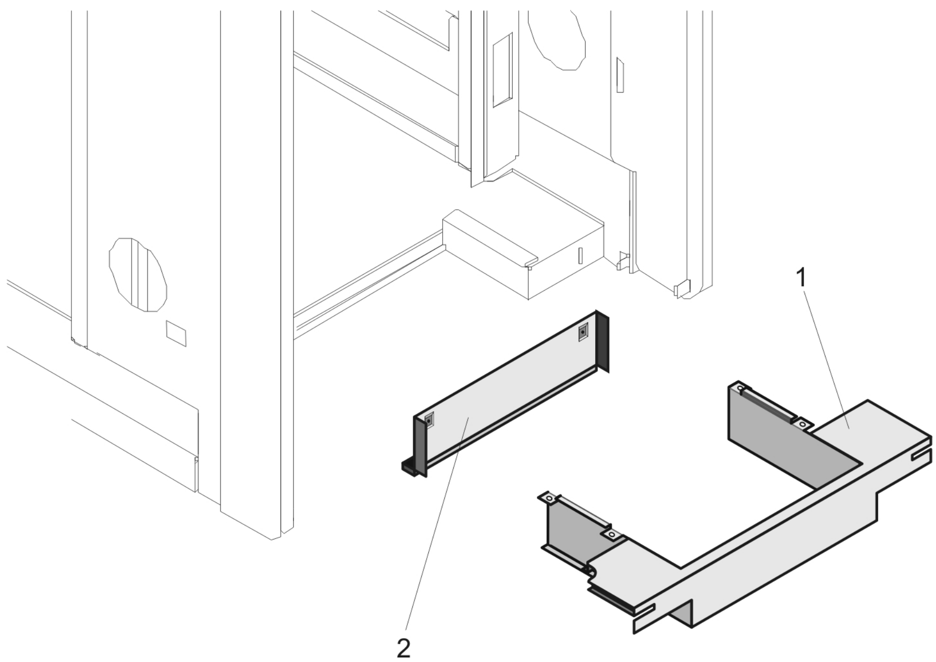


Figure 34. EMC skirt for standard 24 inch powered expansion rack FC 5792/8691 switch-only frames

Cable installation and management procedures

This section describes the procedures you **must** follow when installing administrative LAN and switch cables. Failure to follow these procedures may damage network components. The objectives of these procedures are to:

- Provide switch cables with continuous support and strain relief
- Minimize the possibility of pin damage to the SNI ports
- Form consistent cable groups that comply with EMC certification
- Maintain efficient cooling

Planning information for switch cable installation is detailed in Appendix D, "Cabling the HPS," on page 337.

Switch cable installation and management for server frames:

Procedure concepts: In some configurations, cables that are not properly supported may damage the associated connectors. However, connector damage can be prevented by following the procedure described in this section. This procedure **must** be used for installing I/O cables, administrative LAN cables, and switch cables in server frames. This procedure is written for a frame that is fully populated with p5-575 nodes. For other frames or if the frame you are installing is not fully populated, adjust this procedure as needed.

A high-level workflow for cable installation is as follows:

1. Install frame
2. Route all signal cables up through the tailgate
3. Separate cables into groups for SNIs on the left side of the node and for SNIs on the right side of the node

   Note: Switch cables **must not** be connected to SNIs or SPC cards until the weight of each cable is fully supported.

4. Make certain that switch cable groupings do not interfere with PCI adapter slots
5. Make certain that switch cable groupings do not touch UPIC or other AC cables

   Note: For EMC compliance, you **must** maintain a minimum 25 mm (1 inch) clearance between switch cables and UPIC or other AC cables.
6. Make certain that the cable bend radius allows clearance for closing the rear door but is not so sharp that it places excessive strain on the cable or the associated connectors
7. Cable the frame starting with the upper nodes and working down
8. Apply tailgate support for the cables from left to right
9. Figure 38 on page 103 shows a block diagram of a properly cabled tailgate

Cable management bracket: Figure 35 shows the tailgate assembly (refer to “Frame components (8 inch extenders) and cable management brackets for standard frames” on page 218 for part numbers).

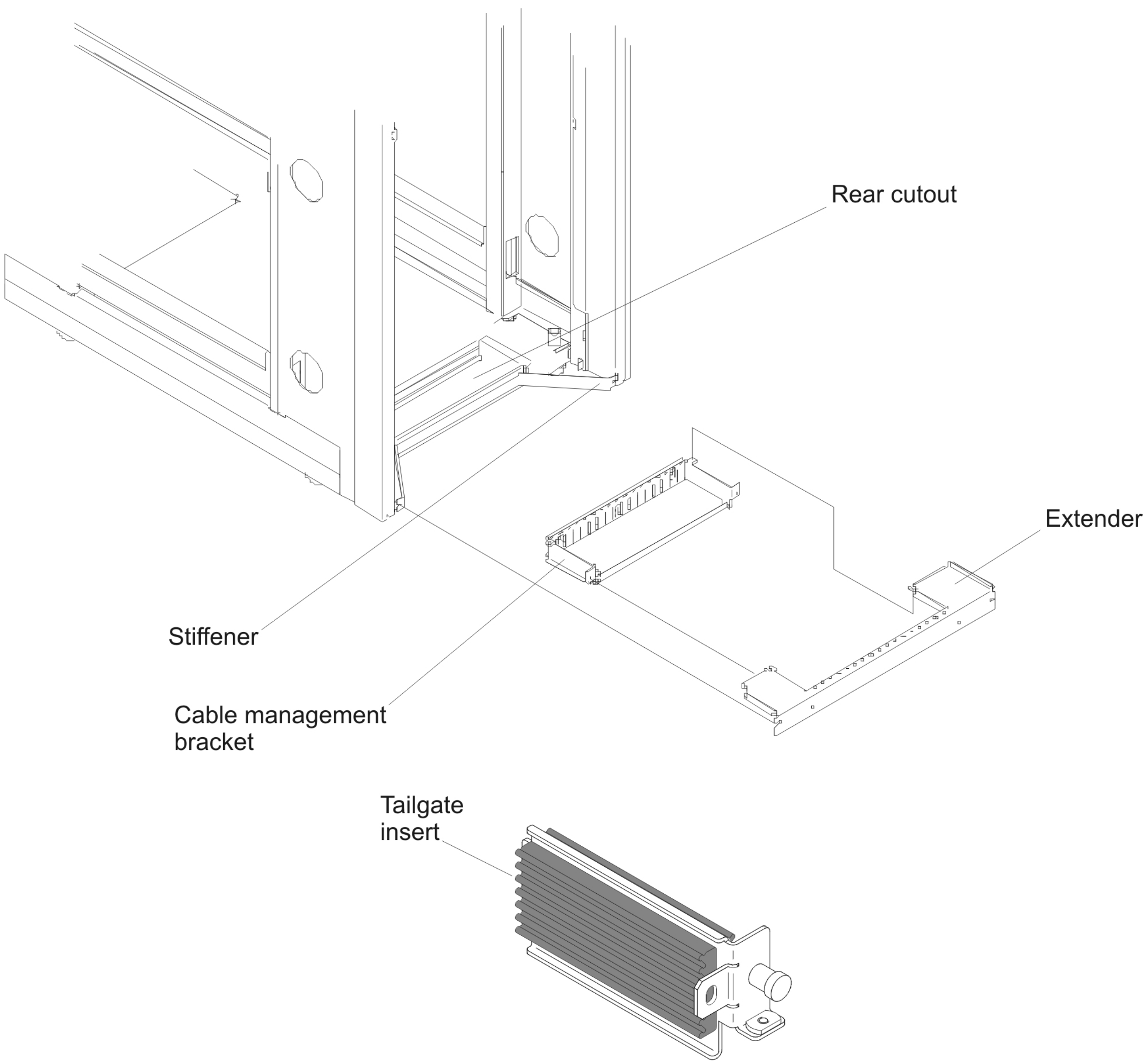


Figure 35. Cable management bracket installation

Cable installation procedure, initial setup:

Note: Do not connect any switch cables to the nodes until instructed to do so.

1. Place the frame in position over the floor tile cutouts
2. Install the frame using the appropriate installation instructions
3. Verify that the cable management bracket is properly installed on the base at the rear of the frame, if not:
   a. Remove orange shipping bracket from the rear of the frame
   b. Install the stiffener into the rear cutout on the base of the frame
   c. Attach the cable management bracket (tailgate) to the stiffener
   d. Make sure that the extender is available for installation after all cables have been installed
4. Route all Management Server, HMC, Ethernet, I/O, and switch cables up through the tailgate

   Notes:
   a. Main power cables do not pass through the tailgate assembly
   b. For EMC compliance, you must maintain a minimum 25 mm (1 inch) clearance between switch cables and UPIC or other AC cables. Switch cables **must not touch** power cables.
5. Separate the Management Server, HMC, Ethernet, I/O, and switch cables into groups for nodes on the left side of the frame and for nodes on the right side of the frame

   Note: Switch cables **must not** be connected to SNIs or SPC cards until the cable weight is supported at the tailgate and by either a cable retainer bracket or a tie base mounted to a rear node shelf.
6. Continue the cable installation procedure with the nodes on the left side of the frame

Cable installation procedure, SNIs on the left side of the node: Before starting this part of the procedure:
- Be aware that this part of the procedure applies to SNIs located on the left side of the node (**as viewed from the rear**) and must be performed before you begin to cable the right side of the frame
- Make certain that all Management Server, HMC, Ethernet, I/O, and switch cables are inside the cable management bracket (tailgate)
- Arrange all cables for SNIs on the left side of the node into a group near the left side of the cable management bracket
- Arrange all cables for SNIs on the right side of the nodes into a group near the right side of the cable management bracket

Note: Do not connect any switch cables to the nodes until instructed to do so.

After the preliminary steps are complete for cabling the left side of the frame:
1. Route the Management Server, HMC and Ethernet cables to the appropriate locations and connect each cable
   - Make certain the Management Server, HMC and Ethernet cables do not interfere with the SNI ports
2. Wire tie the Management Server, HMC and Ethernet cables into a bundle running down the left side of the frame
3. Clamp the Management Server, HMC and Ethernet cables into the first tailgate slot using a tailgate insert (refer to Figure 36 on page 99)

HMC and Ethernet cables

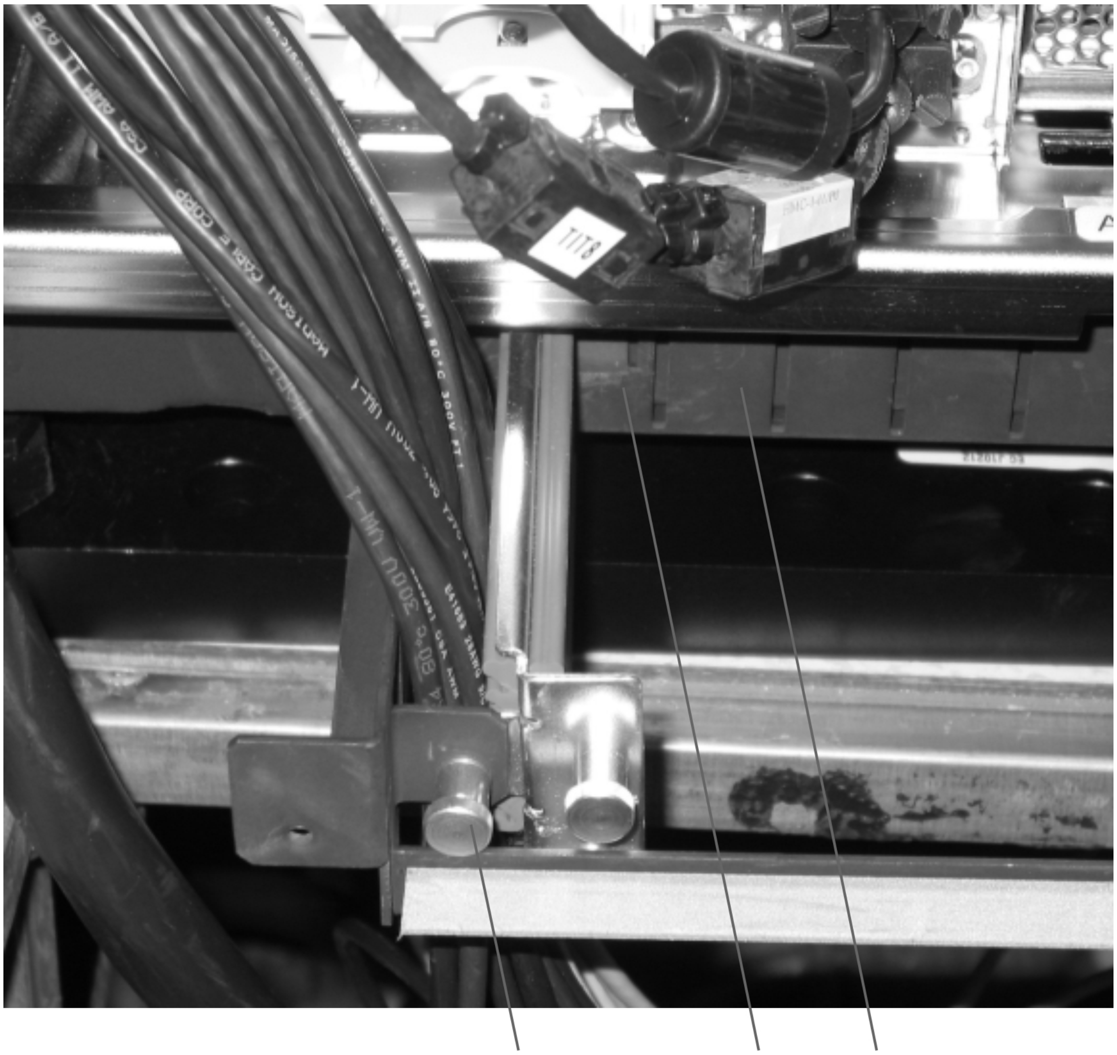


Figure 36. HMC and Ethernet cables clamped in tailgate

4. If the nodes require I/O cables, route them to the appropriate nodes and connect each cable
   - Make certain the I/O cables do not interfere with the SNI ports
5. Wire tie the I/O cables into a bundle running down the left side of the frame
6. Clamp the I/O cables into the tailgate using tailgate inserts
   - Depending on the number and size of the I/O cables, you may have to use one or two tailgate slots and clamping inserts
7. Sort the switch cables into groups based on node and SNI port location, but do not clamp or connect the switch cables until instructed to do so. A simplified description of the next few steps is as follows:
   a. Switch cables will be clamped into the tailgate in groups of either four or two
   b. Nodes in frame slots 8 and 7 will be cabled first and clamped into tailgate slot 2, 3, or 4 depending on the number of I/O cables used in the frame
   c. Switch cables for nodes in frame slots 6 and 5 get clamped into the next available tailgate slot
   d. Continue this cable pattern working down the frame and clamping to the right in the tailgate

Note: For EMC compliance, you must maintain a minimum 25 mm (1 inch) clearance between switch cables and UPIC or other AC cables. Switch cables **must not touch** power cables.

8. Without plugging the switch cables into the SNI ports, take the switch cables for the node in frame slot 8 and raise them into position
   a. Check the cable labels and verify that you have the correct cables for each SNI port
   b. Make certain that the cable for the upper SNI port extends further than the cable for the lower SNI port
   c. Place the wire tie far enough down the cable set so that the cables will have sufficient length for a gentle bend radius
   d. Wire tie the cables together
9. Let the switch cables for the node in frame slot 8 hang from the cable retainer
10. Repeat step 8 for the node in frame slot 7
11. Let the switch cables for the node in frame slot 7 hang from the cable retainer
12. Clamp the switch cables for the nodes in frame slot 8 and 7 into the tailgate using a rubber-faced, tailgate insert with the appropriate thickness of rubber (refer to Figure 37)

Figure 37. Cable management bracket with cables installed

13. Connect the switch cables to the SNI ports on the node in frame slot 8
14. Connect the switch cables to the SNI ports on the node in frame slot 7
15. Repeat steps 8 through 11 for the nodes in frame slots 6 and 5
16. Clamp the switch cables for the nodes in frame slot 6 and 5 into the next available tailgate slot using a rubber-faced, tailgate insert with the appropriate thickness of rubber
17. Repeat steps 13 through 14 for the nodes in frame slots 6 and 5
18. Repeat steps 8 through 14 for the nodes in frame slots 4 and 3

    Note: Switch cables for the node in frame slot 3 are not fastened with a cable retainer.
19. Without plugging the switch cables into the SNI ports, take the switch cables for the node in frame slot 2 and raise them into position
   a. Check the cable labels and verify that you have the correct cables for each SNI port
   b. Make certain that the cable for the upper SNI port extends further than the cable for the lower SNI port
   c. Place the wire tie far enough down the cable set so that the cables will have sufficient length for a gentle bend radius
   d. Wire tie the cable pair together
   e. Switch cables for the node in frame slot 2 are not clamped to a cable retainer
20. Clamp the switch cable pair for the node in frame slot 2 into the tailgate using a rubber-faced, tailgate insert with the appropriate thickness of rubber (refer to Figure 38 on page 103)

    Note: Make certain that the cable pair is located as close to the rear of the frame as possible. Doing so will allow you to optimize the cable bend radius.

21. Connect the switch cables to the SNI ports on the node in frame slot 2
22. Without plugging the switch cables into the SNI ports, take the switch cables for the node in frame slot 1 and raise them into position
    a. Check the cable labels and verify that you have the correct cables for each SNI port
    b. Make certain that the cable for the upper SNI port extends further than the cable for the lower SNI port
    c. Place the wire tie far enough down the cable set so that the cables will have sufficient length for a gentle bend radius
    d. Wire tie the cable pair together
    e. Switch cables for the node in frame slot 1 are not clamped to a cable retainer
23. Clamp the switch cable pair for the node in frame slot 1 into the tailgate using a rubber-faced, tailgate insert with the appropriate thickness of rubber (refer to Figure 38 on page 103)

    Note: Make certain that the cable pair is located as close to the rear of the frame as possible. Doing so will allow you to optimize the cable bend radius.
24. Connect the switch cables to the SNI ports on the node in frame slot 1
25. Continue the cable installation procedure with the SNIs on the right side of the node

Cable installation procedure, SNIs on the right side of the node: The procedure for cabling the SNIs on the right side of the node is similar to the procedure used for SNIs on the left side of the node. Like the left side, the SNIs on the right side of the node are cabled from the top down. In addition the cables are clamped into the tailgate from left to right. The net result is that the cable installation on the right side of the tailgate is a mirror image of the cables on the left side of the tailgate. This means that you will start the procedure by clamping switch cables for the upper nodes and finish with the Management Server, HMC, and Ethernet cables.

Before starting this part of the procedure:
- Be aware that this part of the procedure applies to SNIs located on the right side of the node (**as viewed from the rear**) and must be performed **after** you cable the left side of the frame
- Make certain that all cables for the SNIs on the left side of the node are properly fastened to the nodes
- Verify that all Management Server, HMC, Ethernet, I/O, and switch cables for the right side of the frame are inside the tailgate
- If I/O cables are not installed and you want to locate switch cables closer to the right side of the tailgate, you will need to use foam block tailgate inserts
  – After the last tailgate insert (the one clamping the cables for the left side of the frame), install one or more foam block tailgate inserts into the open slots (refer to Figure 38 on page 103)

Note: Do not connect any switch cables to the nodes until instructed to do so.

After the preliminary steps are complete for cabling the right side of the frame:
1. Sort the switch cables into groups based on node and SNI port location, but do not clamp or connect cables until instructed to do so. An *overview* of the next few steps is as follows:
   a. Switch cables will be clamped into the tailgate in groups of either four or two
   b. The nodes in frame slots 8 and 7 will be cabled first and clamped into tailgate slot 8, 9, or 10
      - The tailgate slot number is dependent on the number of I/O cables or foam block tailgate inserts used
   c. Switch cables for nodes in frame slots 6 and 5 get clamped into the next available tailgate slot
   d. Continue this cable pattern working down the frame and clamping to the right in the tailgate

   Note: For EMC compliance, you must maintain a minimum 25 mm (1 inch) clearance between switch cables and UPIC or other AC cables. Switch cables **must not touch** power cables.
2. Before routing the switch cables, position the Management Server, HMC, Ethernet, and I/O cables but **do not** clamp these cables into the tailgate until instructed to do so

a. Route the Management Server, HMC, and Ethernet cables to the appropriate locations and connect each cable
   - Make certain the Management Server, HMC, and Ethernet cables do not interfere with the SNI ports
b. Wire tie the Management Server, HMC, and Ethernet cables into a bundle running down the right side of the frame
c. If the nodes require I/O cables, route them to the appropriate nodes and connect each cable
   - Make certain the I/O cables do not interfere with the SNI ports
d. Wire tie the I/O cables into a bundle running down the right side of the frame

3. Without plugging the switch cables into the SNI ports, take the switch cables for the node in frame slot 8 and raise them into position
   a. Check the cable labels and verify that you have the correct cables for each SNI port
   b. Make certain that the cable for the upper SNI port extends further than the cable for the lower SNI port
   c. Place the wire tie far enough down the cable set so that the cables will have sufficient length for a gentle bend radius
   d. Wire tie the cables together
4. Let the switch cables for the node in frame slot 8 hang from the cable retainer
5. Repeat step 3 for the node in frame slot 7
6. Let the switch cables for the node in frame slot 7 hang from the cable retainer
7. Clamp the switch cables for the nodes in frame slot 8 and 7 into the tailgate using a rubber-faced, tailgate insert with the appropriate thickness of rubber (refer to Figure 37 on page 100)
8. Connect the switch cables to the SNI ports on the node in frame slot 8
9. Connect the switch cables to the SNI ports on the node in frame slot 7
10. Repeat steps 3 through 6 for the nodes in frame slots 6 and 5
11. Clamp the switch cables for the nodes in frame slot 6 and 5 into the next available tailgate slot using a rubber-faced, tailgate insert with the appropriate thickness of rubber
12. Repeat steps 8 through 9 for the nodes in frame slots 6 and 5
13. Repeat steps 3 through 9 for the nodes in frame slots 4 and 3

    Note: Switch cables for the node in frame slot 3 are not fastened with a cable retainer.
14. Without plugging the switch cables into the SNI ports, take the switch cables for the node in frame slot 2 and raise them into position
    a. Check the cable labels and verify that you have the correct cables for each SNI port
    b. Make certain that the cable for the upper SNI port extends further than the cable for the lower SNI port
    c. Place the wire tie far enough down the cable set so that the cables will have sufficient length for a gentle bend radius
    d. Wire tie the cable pair together
    e. Switch cables for the node in frame slot 2 are not clamped to a cable retainer
15. Clamp the switch cable pair for the node in frame slot 2 into the tailgate using a rubber-faced, tailgate insert with the appropriate thickness of rubber (refer to Figure 37 on page 100)

    Note: Make certain that the cable pair is located as close to the rear of the frame as possible. Doing so will allow you to optimize the cable bend radius.
16. Connect the switch cables to the SNI ports on the node in frame slot 2
17. Without plugging the switch cables into the SNI ports, take the switch cables for the node in frame slot 1 and raise them into position
    a. Check the cable labels and verify that you have the correct cables for each SNI port
    b. Make certain that the cable for the upper SNI port extends further than the cable for the lower SNI port

c. Place the wire tie far enough down the cable set so that the cables will have sufficient length for a gentle bend radius
d. Wire tie the cable pair together
e. Switch cables for the node in frame slot 1 are not clamped to a cable retainer

18. Clamp the switch cable pair for the node in frame slot 1 into the tailgate using a rubber-faced, tailgate insert with the appropriate thickness of rubber (refer to Figure 37 on page 100)

    Note: Make certain that the cable pair is located as close to the rear of the frame as possible. Doing so will allow you to optimize the cable bend radius.

19. Connect the switch cables to the SNI ports on the node in frame slot 1
20. If they are used, clamp the I/O cables into the tailgate using tailgate inserts
    - Depending on the number and size of the I/O cables, you may have to use one or two tailgate slots and clamping inserts
21. Clamp the Management Server, HMC and Ethernet cables into the last tailgate slot using a tailgate insert (refer to Figure 36 on page 99)
22. Insert foam block tailgate inserts into any open tailgate slots

If you have properly cabled the frame, the cable layout should look like Figure 38.

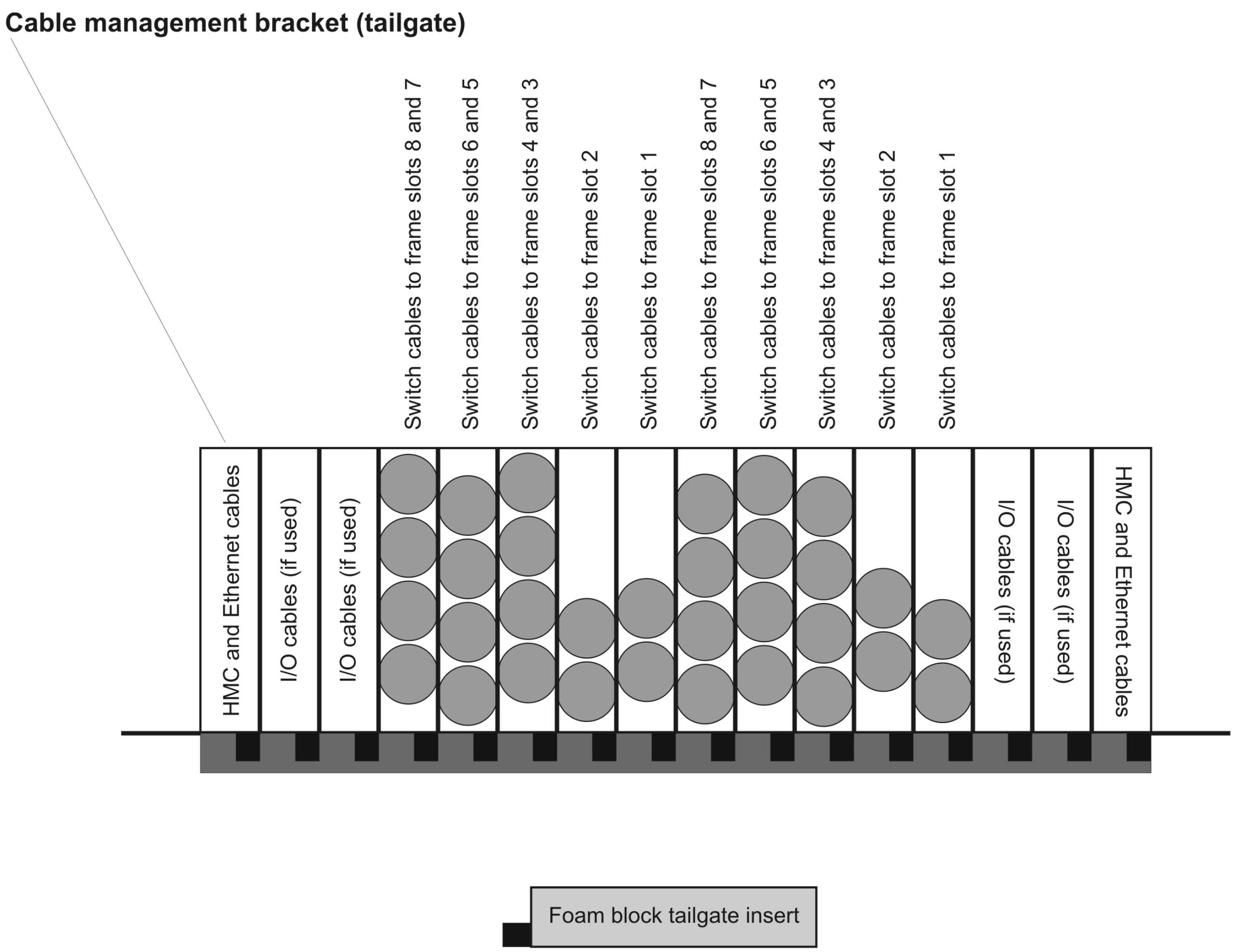


Figure 38. Proper cable layout inside the cable management bracket

Post-installation tasks for switch hardware

After all hardware, firmware, and software installation tasks are complete, you must verify the system and report *Installation Complete*.

1. Before reporting *Installation Complete* perform switch verification procedures described in "Bringing the network online and reporting Installation Complete" on page 109

   Note: There are options for testing network links using the HMC command line. However, these procedures are limited to IBM CEs using Support Center directions.
2. Perform post install activities such as storing ship group tools and other items

Firmware installation

Step 1: HMC code load

Attention: The HMC code load is a customer responsibility.

If you are installing a HPS into an existing IBM eserver p5 server frame **or** if you are attaching an existing IBM eserver p5 server to another frame that has a HPS installed, you must update the HMC Licensed Internal Code (LIC).

The HMC software must be Release 4 Version 5 or later. You can verify this information by entering `lshmc -V` on the HMC command line. If the HMC software must be updated, refer to either *Your Guide to Service, Support, and Documentation*, (SA38-0584) or to the ″HMC Fixes″ section on the HMC Information Center. To access ″HMC Fixes″

1. Open the HMC GUI Navigation Area
2. Click ″Information Center and Setup Wizard″
3. Click ″Launch the eServer Information Center″
4. Click ″Service, Support, and Troubleshooting
5. Click ″Service and Support″
6. Click ″Getting Fixes″
7. Click ″HMC Fixes″
8. Follow the instructions to update the HMC code

Notes:

1. When the IBM WebSM GUI is installed, if you try to verify the HMC code level by using the ″Help″ menu on the WebSM GUI, the value returned for the software level will be the IBM WebSM GUI version.
2. In clusters with multiple HMCs, you can use the CSM Management Server to facilitate LIC installation by using the remote command capabilities of the Management Server to reach each HMC.
3. When you configure the Cluster 1600 with multiple HMCs, you must load all HPS related software and firmware on all network HMCs. After completing the code updates, you must verify that all HMCs are at the same code and APAR levels. Refer to "Hardware Management Console" on page 58 for details on multiple HMC configurations.

Step 2: Verify HMC code level

Verify the HMC code level using the GUI. If the code level still does not meet the minimum requirements call the next level of support. To verify the code level:

1. Select **Help** on the HMC GUI
2. Select **About Hardware Management Console** to display the code level installed on the HMC
3. The code level must be Version 4 Release 5 or later with all HPS maintenance updates installed

Notes:

1. When the IBM WebSM GUI is installed, if you try to verify the HMC code level by using the ″Help″ menu on the WebSM GUI, the value returned for the software level will be the IBM WebSM GUI version.
2. You can also verify the HMC code level by entering `lshmc -V` on the HMC command line.

Step 3: Set the date and time on the console

The battery-operated clock keeps the date and time for the HMC. You may need to set the console date and time under the following circumstances:

- If the battery is replaced in the HMC
- If your system is physically moved to a different time zone

To set the console date and time, refer to the *IBM Hardware Management Console for pSeries Installation and Operations Guide*.

Step 4: Setting frame numbers

Attention: This procedure is disruptive to system operations. You must verify that the servers are in the ″Power Off″ state as reported on the Server Management View **before** you set frame numbers.

Each frame in the cluster must be assigned a unique frame number. You can set these identification numbers by using either the ″frame″ command on the CSM Management Server or from the HMC GUI. Refer to *CSM for AIX 5L V1.4.1 Command and Technical Reference*, (SA22-7934) for additional details.

To set the frame number:

1. On the Navigation area of the HMC GUI, click ″Frame Management″
2. Right click the selected frame
3. Click ″Properties″ on the sub-menu
4. From the General properties tab, type the frame number in the field labeled ″Number″
5. Click ″OK″
6. The frame will briefly show a status of ″No connection″ during this process

Notes:

1. HPSNM frame numbers are unique to the HPS network.
   - The HPSNM frame numbers are different than the AIX generated frame location codes. Refer to “Location codes” on page 173 for additional information.
2. It is the responsibility of the customer to generate and assign switch-associated (HPSNM) frame numbers.
3. Each frame identification number must be a unique integer. Negative values, zero, and alpha characters are not allowed.
4. Do not assign frame numbers to any expansion frames. These frame types use the frame number assigned to the associated primary frame.

Step 5: Installing power subsystem microcode and managed system (GFW) firmware

Attention: Installation of the power subsystem microcode and the managed system (GFW) firmware are customer responsibilities.

The required versions for the power subsystem microcode and the managed system firmware (GFW code) for each system need to be determined at the time of installation. You can use the HMC Licensed Internal Code Maintenance option on the HMC GUI to:

- Check the currently installed version of the power subsystem microcode and the managed system firmware
- Update microcode and firmware
- Verify updated code levels and the activation status of the installed code

To upgrade the power subsystem and GFW microcode, use the instructions provided in the HMC eServer Hardware Information Center. From the HMC GUI Navigation Area

1. Click ″Information Center and Setup Wizard″
2. Click ″Launch the eServer Information Center″
3. Click ″Service, Support, and Troubleshooting
4. Click ″Service and Support″
5. Click ″Getting Fixes″
6. Click ″Firmware (Licensed Internal Code) fixes″
7. Click ″Applying firmware (Licensed Internal Code) fixes″

This will: allow you to determine the existing and available firmware levels, give you firmware installation instructions using the HMC LIC GUI, and provide verification for successful installation.

Note: You can also use the HMC command line to update power subsystem microcode and managed system firmware. This requires two HMC commands:

- `lslic` to list the currently active version
- `updlic` to install code updates
  - Use `updlic -t power` to install microcode updates
  - Use `updlic -t sys` to install GFW firmware updates

You **must** refer to the HMC manpages for detailed information on using these commands.

Software installation

Attention: Some service actions require privileged access to specific HPSNM commands and data on the CSM Management Server. Refer to “Service login ID” on page 56 for information on setting up a user account with secure access.

Step 1: Define LPARs and assign adapters

Attention: Logical Partition (LPAR) definition, IP address, and netmask assignment must be performed by the System Administrator.

Before you install AIX on the cluster, you must create LPAR definitions, allocate system resources, and assign IP addresses across the network. To allocate these system resources, go to the Navigation Area of the HMC GUI and:

1. Click ″Information Center and Setup Wizard″
2. Click ″Launch the eServer Information Center″
3. Click ″Partition the Server″
4. Click ″Partitioning for AIX″
5. Click ″Configuring AIX Logical Partitions″
6. From that panel, follow the instructions for creating LPARs. These instructions include:
   - Define the system logical partitions (LPARs)

- Allocate CPU, memory, I/O slot resources for all LPARs
- Assign SNI links to each switch connected LPAR

Step 2: Install CSM on the Management Server

Refer to the appropriate installation instructions and install the CSM Management Server (including the required Cluster-Ready Hardware Server (CRHS) software)

Note: As part of the Management Server installation process, make sure that you review "CSM Management Server" on page 55 for information about that part of the configuration process.

Cluster System Manager (CSM) software is part of the base AIX installation. For most AIX installations, CSM is optional. However, if the cluster is configured with the High Performance Switch, CSM is **required**. For detailed information about CSM installation, refer to Chapter 4 of *CSM for AIX 5L and Linux® V1.4.1 Planning and Installation Guide*, SA23-1344.

Note: After completing CSM installation, return to this location to finish cluster installation and configuration.

Verify CSM installation

You must verify several items to make sure that the CSM Management Server was correctly installed:

- Make sure that the `csm.hpsnm` and `csm.gui.websm` filesets are installed
  - If the filesets have not been installed, the System Administrator can do so at this time
    - If needed, the System Administrator can obtain the `csm.hpsnm` and `csm.gui.websm` filesets from the AIX installation media
  - The option to "Automatically increase filesystems" should have been used while those filesets were installed
- To accommodate the HPSNM log files, `/var` on the CSM Management Server should have been increased to 1 Gigabyte
- Make sure that the Management Server is connected to the cluster service network (refer to "Connecting the cluster service network" on page 54)
- Make sure that the CSM Management Server was rebooted after the filesets were installed

Step 3: Configure Cluster-Ready Hardware Server (CRHS)

Before you can begin the final tasks to report Installation Complete, the **System Administrator** must configure the Cluster-Ready Hardware Server software.

Note: For an overview of CRHS software, refer to "Cluster-Ready Hardware Server" on page 57.

Attention: The DHCP server for an HPS cluster must be on the CSM Management Server and not an HMC.

Attention: All new frames and HMCs must be identified and added to the device database on the Cluster-Ready Hardware Server. Refer to "Enabling Cluster-Ready Hardware Server" on page 57 for additional information and procedural references.

Before you can configure CRHS, you must complete the following tasks to start the HMC configuration process:

1. Disable DHCP on the HMC and reboot the HMC
2. Configure DHCP on CSM Management Server so that the lease time never expires
   - This is needed for auto discovery of the FSPs and the BPAs by the Cluster-Ready Hardware Server (CRHS)
3. Configure CRHS

- For detailed information about installing and configuring Cluster-Ready Hardware Server, refer to *CSM for AIX 5L V1.4.1 Administration Guide*, SA22-7918

Step 4: Set up the CSM cluster

Attention: You must define the cluster nodes before you install AIX on the cluster LPARs

For detailed information about setting up the CSM cluster, refer to Chapter 8 of *CSM for AIX 5L V1.4.1 Planning and Installation Guide*, SA22-7919

Note: After setting up the CSM cluster, return to this location to finish cluster installation and configuration.

Step 5: Assign IP addresses for SNIs

1. Assign IP addresses and netmasks for all sniX and ml0 interfaces for each Switch Network Interface location
   a. On the Management Server, issue the `getadapters` command
      - Refer to *CSM for AIX 5L V1.4.1 Command and Technical Reference*, (SA22-7934) for additional information on this command
   b. Edit the stanza file created by the `getadapters` command to add IP addresses and netmasks for all sniX and ml0 references associated with Switch Network Interfaces (SNIs)
   c. Load the revised stanza file onto the NIM server
      - If you have not defined the NIM server, you **must** do so now. The revised stanza file **must** be loaded on the NIM server **before** you install AIX on the nodes.
      - Refer to *AIX 5L Version 5.3 Installation Guide and Reference* for additional information

        Note: Make certain that you are referring to the correct AIX documentation for the AIX version installed on the system.

Step 6: Install AIX on the nodes

Attention: To install AIX on the nodes, you **must** refer to Chapter 12 of *CSM for AIX 5L and Linux V1.4.1 Planning and Installation Guide*, SA23-1344. Chapter 12 of that document contains:

- AIX installation procedures
- Set up and configuration procedures for Network Installation Manager (NIM)

Using NIM functions, install AIX on all cluster LPARs.

Notes:

1. The NIM secondary adapter support will configure all sniX and ml0 interfaces
2. If AIX was preinstalled on the system, verify the installed AIX level supports the HPS by checking the ″READ ME FIRST″ for the HPS release. If the AIX level is not correct, you will have to reinstall AIX to the proper level.
3. As part of the AIX installation, you must configure Technical Large Page Support on each system LPAR. Refer to *Switch Network Interface for eServer pSeries High Performance Switch Guide and Reference*, SC23-4869 and also contact the next level of support for additional information on this task.
4. During AIX installation, you must select specific CSM options. These options place the correct CSM filesets on LPARs and the Management Server.
5. Refer to *AIX 5L Version 5.3 Installation Guide and Reference* for additional information.

   Note: Make certain that you are referring to the correct AIX documentation for the AIX version installed on the system.

6. As an alternative to NIM server configuration, you can also use the ″smitty commodev″ fastpath. The fastpath method allows you to configure IP addresses and netmasks after you have installed AIX on the cluster. However, you will have to login to each LPAR and select ″Switch Network Adapter″ to configure each snX and ml0 interface.

Cluster bring-up and Installation Complete

Attention: Before you can start the final installation procedure (refer to "Bringing the network online and reporting Installation Complete"), you must verify that the customer has installed AIX and CSM on the system.

If the following configuration tasks have not been completed, you may have to schedule a return trip to the customer site to complete the installation.

AIX installation
: As part of the AIX installation, you must configure Technical Large Page Support on each system LPAR. Large Page Support provides buffer space for send and receive packets and device drivers. The Large Page memory allocation for each LPAR is linked to the number of SNIs in the system and it is approximately equal to the Large Page requirements for: drivers + receive buffers + send buffers. For information on configuring Technical Large Page Support, refer to *Switch Network Interface for eServer pSeries High Performance Switch Guide and Reference*, SC23-4869 or contact the next level of support for the latest configuration requirements.

CSM installation
: As part of the CSM installation, you must verify that High Performance Switch Network Manager (HPSNM) is functional and that it recognizes all network components. For information on installing CSM, refer to *CSM for AIX 5L V1.4.1 Planning and Installation Guide*, SA22-7919.

Bringing the network online and reporting Installation Complete

Concepts for bringing the network online

After you have installed all network hardware, you must:

- Enable High Performance Switch Network Manager (HPSNM)
- Verify that HPSNM recognizes all components as members of the cluster resource domain (refer to "Cluster-Ready Hardware Server concepts" on page 57)

After completing those tasks, you must use HPSNM to bring the network online. As part of this procedure, you will verify the switch network and determine if you can report *Installation Complete* (service code 20). For details on the processes running during network initialization and verification, refer to "Switch network discovery" on page 478.

Bringing the HPS network online requires four sequential actions:

1. "Step 1: Enable HPSNM" on page 110
2. "Step 2: Initialize the network" on page 113
3. "Step 3: Verify the network" on page 113
4. "Step 4: Setting HPSNM to Normal Operation Mode and reporting Installation Complete" on page 124

Note: Prior to enabling HPSNM and verifying the network, all installation tasks must be complete. Refer to Chapter 6, "Installation," on page 67 and "Installing switch network connection components" on page 323 for details on these tasks. As a final check, visually inspect the hardware installation to make sure that the hardware is installed as planned.

Step 1: Enable HPSNM

Notes:

1. You must install High Performance Switch Network Manager (HPSNM) on the CSM Management Server. You can control switch management functions from that location or from a remote device. Refer to "Accessing system information" on page 152 for additional information about remote access such as:
   - "Accessing HPSNM from an HMC" on page 153
   - "Accessing the HMC GUI from the CSM Management Server" on page 153
2. As you complete Step 1 and Enable HPSNM, you will be directed to designate the ELA Master HMC and the ELA Master Backup HMC. After you designate these specialized HMCs, if you are directed to check Service Focal Point (SFP) you **must** do so from the ELA Master HMC.

To enable HPSNM:

1. Verify that the CSM Management Server is installed and configured
   - The correct HPSNM fileset is `csm.hpsnm`
   - Other CSM and RSCT filesets are also required, refer to *CSM for AIX 5L V1.4.0.10 Planning and Installation Guide*, SA22-7919
2. Verify that all HMCs are installed and that they have the recommended level of `IBMhsc.HPSNM_log-1.4.1.0-1 RPM`
3. If not already done, power up the HMCs and UEPO on the frames
   - **Do not** power up server CECs until directed to do so
   - If the CECs are already powered up, power them off from the HMC
4. Verify that the system recognizes each component by making sure that all frames and servers appear on HPSNM
   a. Issue the command `/usr/bin/wsm` to bring up HPSNM on the Management Server
   b. From the Navigation area of the HPSNM GUI, open the ″CSM Cluster″ selection
   c. Click ″HPS Network Manager″
   d. When the ″HPS Network Manager″ panel opens, click ″Display Cluster Components″
      - Depending on the size of your network, it may take several minutes for the system to display all network components
      - If the network components are not listed in five minutes, refresh the display
      - If needed, wait an additional five minutes and refresh the display
   e. When fully resolved, the ″Display Cluster Components″ selection shows an ID list and item count for switches and CECs
      - If the system is unable to resolve the network components, look for problems in the Ethernet components of the cluster service network

      Note: SNIs are not listed in the ″Display Cluster Components″ panel.
5. Make certain that all primary frames have an HPSNM frame number assigned
   - This should have been done during switch installation as part of the code load procedure (refer to "Installing frames with an integral HPS" on page 68).
   - If possible verify that the frame model type and frame name correspond to the installation records.
     – The frame model type is listed on the UEPO switch
     – The frame name was assigned by the customer

   Notes:

   a. HPSNM frame numbers are unique to the HPS network.
      - AIX generates its own location codes that are separate from the HPSNM frame numbers. Refer to "Location codes" on page 145 for additional information on these codes.
   b. It is the responsibility of the customer to generate and assign HPSNM frame numbers.
   c. Each frame identification number **must** be a unique integer. Negative values, zero, and alpha characters are not allowed.

d. Do not assign frame numbers to expansion frames. Expansion frames use the frame number assigned to the associated primary frame.

6. From the ″HPSNM Network Manager″ panel, define the switch network topology:
   a. Click on ″Select Logical Topology″
   b. When the dialog box opens, select the number of networks and the topology option having the best match to your system
      - Select ″1″ or ″2″ as the number of networks
      - The topology selection provides you with choices for all supported network configurations
        – For example: with either one or two networks, `2NSB_0ISB_32EP` would be the selection for a two NSB network without ISBs and having a maximum of 32 endpoints
        – Refer to Appendix C, “HPS network configuration,” on page 305 and Appendix D, “Cabling the HPS,” on page 337 for detailed information on supported network configurations

      Notes:
      1) Make your topology selection based on the configuration of the *individual* networks. **Do not** select the topology based on the total system configuration. For example, if your system has 128 endpoints spread across two networks, you must select a topology with 64 endpoints for each of the individual networks.
      2) The topology options listed in this dialog box are defined with the maximum number of endpoints for each network configuration. However, your network may not utilize the maximum number of endpoints. Therefore, your topology selection only needs to match the number of NSBs and ISBs presented in the list of options.
7. From the ″HPSNM Network Manager″ panel, designate the ELA Master HMCs:
   a. On the main panel, scroll down to ″Tasks″ and click ″Select HPSNM ELA Master″
   b. When the dialog box opens, select the Current ELA Master and the Current ELA Backup
   c. Click ″OK″ after making your selections

   Note: You can also designate the ELA Master HMCs from the command line using the `chswelamast` command.
8. From the ELA Master HMC, make certain that all serviceable events have been closed and cleared from the event log
   - Open Service Focal Point
   - Open the ″Manage Serviceable Events″ panel
   - Verify that panel does not list any open events

   Note: Before you proceed to the next step, if the CECs are powered up, you **must** power them off from the HMC
9. From the ″HPSNM Network Manager″ panel, enable the HPSNM software for network verification:
   a. On the Network Manager panel, click ″Enable HPSNM Software for Switch Network Verification″
   b. When the dialog box opens, select ″YES″ to enable HPSNM

   Note: Make certain that you select the option for Switch Network Verification and not the option to ″Enable HPSNM Software for Normal Operation.″
10. Refresh the display
11. Open the ″Switch Topology View″ panel to check the network configuration

    Note: It may take up to ten minutes for the system to fully display the topology.
12. On the ″Switch Topology View″ panel, verify that the ″Discovered Topology″ is the same as the ″Selected Topology.″ If the ″Discovered Topology″ is not the same as the ″Selected Topology″ look for one of the following causes:
    - The ″Selected Topology″ may have been incorrectly specified in step 6
    - The network may have been incorrectly cabled
    - There may be an error in the cable planning data

Check the ″Selected Topology″:

Verify that the ″Selected Topology″ specified in step 6 is correct by comparing the number of NSBs and ISBs entered in that step is the same as the number of NSBs and ISBs specified in the network planning information.

Note: If you are making this comparison for a two network configuration, make sure that the choice for selected topology was based on the configuration of the individual networks and not for size of the overall system.

If the ″Selected″ topology is not correct:

a. Disable HPSNM:
   1) Open the CSM Management Server GUI
   2) Select ″High Performance Switch Network Manager″
   3) On the HPSNM Network Management panel, click ″Disable HPSNM software″
b. From the HPSNM Network Management panel, use the ″Select Logical Topology″ task to redefine the network topology
c. Enable HPSNM for Switch Network Verification:
   1) Open the CSM Management Server GUI
   2) Select ″High Performance Switch Network Manager″
   3) On the HPSNM Network Management panel, click ″Enable HPSNM Software for Switch Network Verification″

      Note: Make certain that you select the option for Switch Network Verification and not the option to ″Enable HPSNM Software for Normal Operation.″
d. Open the ″Switch Topology View″ panel and verify that the ″Discovered Topology″ is the same as the ″Selected Topology″
   - If the selected and discovered topologies do not match, repeat this procedure and verify that the ″Selected Topology″ was entered correctly in step 6

   Note: If the selected and discovered topologies do not match, make certain that you are taking the correct action from the following list of possible causes:
   - The ″Selected Topology″ may have been incorrectly specified in step 6
   - The network may have been incorrectly cabled
   - There may be an error in the cable planning data

Check network cabling:

Verify that the network was correctly cabled by comparing the network planning sheets to the physical network cabling. If the network was cabled incorrectly:

a. Disable HPSNM
   1) Open the CSM Management Server GUI
   2) Select ″High Performance Switch Network Manager″
   3) On the HPSNM Network Management panel, click ″Disable HPSNM software″
b. Make all needed cable corrections
c. Enable HPSNM for Switch Network Verification
   1) Open the CSM Management Server GUI
   2) Select ″High Performance Switch Network Manager″
   3) On the HPSNM Network Management panel, click ″Enable HPSNM Software for Switch Network Verification″
d. Open the ″Switch Topology View″ panel and verify that the ″Discovered Topology″ is the same as the ″Selected Topology″

Note: If the selected and discovered topologies do not match, make certain that you are taking the correct action from the following list of possible causes:
- The ″Selected Topology″ may have been incorrectly specified in step 6
- The network may have been incorrectly cabled
- There may be an error in the cable planning data

Check cable planning data:

If there is an error in the cable planning data, that information will have to be recalculated. If *all* of the following conditions are true, there may be a problem with the cable planning data:

- The ″Selected Topology″ appears correct in the Switch Topology View
- The actual network cabling matches the cable planning data
- The ″Selected Topology″ does not match the ″Discovered Topology″

Step 2: Initialize the network

1. Initialize the network by powering up the servers from the HMC and placing all CECs and LPARs in operating mode
   - As the switch network initializes, the system retrieves allocation and address information from the HMCs and NIM server and uses this information to generate network tables and install LPAR software. During this process it is normal to see network components reporting a link status of ″Unknown:Working″ or ″Unknown:Unknown″ on the HPSNM GUI. However, after all server CECs have finished powering up, network components **should not** display an unknown status.
2. When all CECs are powered up and initialization is complete, open the Switch Topology view on the HPSNM GUI:
   - If none of the network components show ″Unknown″ or ″Working″ as a link status, continue with "Step 3: Verify the network"
   - If any components report a link status of ″Unknown″ or ″Working,″ refer to Table 54 on page 271 and take the appropriate service action

Note: For additional information on the network initialization process, refer to "Switch network discovery" on page 478.

Step 3: Verify the network

In this step, you will complete three main tasks in the following order:

1. "Task 1: Verify SNI and switch chip ports"
2. "Task 2: Verify the availability of system resources" on page 116
3. "Task 3: Run the host-based verification tools" on page 122

After you successfully complete these tasks, continue with "Step 4: Setting HPSNM to Normal Operation Mode and reporting Installation Complete" on page 124.

Notes:

1. If the HPSNM GUI displays a network status message on either the Switch Topology View or the Endpoint View, refer to "Network status codes on HPSNM" on page 271.
   - Examples of network status messages include `Svc reqd:Miswired` and `Down:Re-cabled`
   - For a complete list of network status messages and the associated service actions, refer to Table 54 on page 271
2. Before you can perform "Task 3: Run the host-based verification tools" on page 122 and report installation complete, the customer **must** install AIX on the system. Depending on the time required for AIX installation, you may have to schedule a return trip to the customer site to complete the installation.

Task 1: Verify SNI and switch chip ports: During this task, you will use HPSNM to inspect the network and fix reported problems. As part of the network inspection you will:

1. "Verify switch chip ports"
2. "Verify SNI chip ports" on page 115

Verify switch chip ports:

Switch chip ports

The switch chip ports referred to in this task are the switch planar communication ports. Each switch planar has eight switch chips and each switch chip has eight communication ports. Switch chip ports 0, 1, 2, and 3 are connected to the external ports on the switch planar and are therefore referred to as offboard links. Switch chip ports 4, 5, 6, and 7 are used for communication between the eight switch chips. Since switch chip ports 4, 5, 6, and 7 are associated with internal communication, they are referred to as onboard links.

1. From HPSNM, check the status of switch chip ports 4, 5, 6, and 7:
   a. Open the ″Switch Topology View″ panel
   b. From the main menu, click ″File″ and select ″Expand All″
   c. From the main menu, click ″Filter″
      1) From the drop down menu, select ″Edit Filter″
      2) Select ″Link Status″
      3) If this is:
         - The first time through this procedure, select ″Not Operational″ as the filtering criteria
         - The second time through this procedure, select ″Svc Required″ as the filtering criteria

         Note: With these filters, the system check will only display network components with problems. If a component is OK, it will not display on the GUI screen. However, if your network has unused links, the Switch Topology View sees this as a faulty connection and displays a status of Not Operational for that location.
   d. The refreshed display shows all switch planar ports across the entire network that have a status of:
      ″Not Operational″ for the first time through this procedure
      ″Svc Required″ for the second time through this procedure

      Note: If the display **does not** show ″Not Operational″ or ″Svc Required″ for switch chip ports 4, 5, 6, or 7, this indicates that all switch chip ports 4, 5, 6, or 7 across the network are OK and you can go to step 2.
   e. If the display shows a status of ″Not Operational″ or ″Svc Required″ for switch chip ports 4, 5, 6, or 7:
      1) The problem is on a switch planar, ignore any errors reported on switch chip ports 0, 1, 2, or 3
      2) Determine which planar is reporting the fault
      3) Replace the planar
      4) Refresh the GUI display
      5) When the display does not show a status of ″Not Operational″ or ″Svc Required″ for switch chip ports 4, 5, 6, or 7, go to step 2 and check the status of switch chip ports 0, 1, 2, and 3
2. Check the status of switch chip ports 0, 1, 2, and 3:
   a. Make certain that the ″Filter″ criteria on the Switch Topology View panel is still set to ″Link Status″ and refresh the GUI
   b. If this is:
      - The first time through this procedure, select ″Not Operational″ as the filtering criteria
      - The second time through this procedure, select ″Svc Required″ as the filtering criteria
      - The third time through this procedure, select ″No Signal″ as the filtering criteria

      Note: With these filters, the system check will only display network components with problems. If a component is OK, it will not display on the GUI screen. However, if your network has unused links, the Switch Topology View sees this as a faulty connection and displays a status of Not Operational for that location.
   c. If the Switch Topology View:
      - **Does not** show any switch chip ports reporting a status of ″Not Operational,″ ″Svc Required,″ or ″No Signal,″ continue with “Verify SNI chip ports” on page 115
      - Shows:

– ″Not Operational″ or ″Svc Required″ as a status for switch chip ports 0, 1, 2, or 3 this indicates three possible conditions that may be causing the fault:
  1) **Empty**: There is a Switch Port Connection card slot on the switch that is either filled with a blank connection card or it is empty. You will need to review the switch cable planning data and determine whether or not that slot was supposed to have a functioning Switch Port Connection card installed.
     - If the slot is blank and this matches the planning data, ignore this error and continue.
     - If the planning data shows that the slot should not be blank, re-cable the connection card as required. After this service action, refresh the GUI, verify the fix, and continue.
  2) **Miswire**: Review the switch cable planning data for that Switch Port Connection card
     - If the cable connections on the Switch Port Connection card do not match the planning data, re-cable the ports as needed. After this service action, refresh the GUI, verify the fix, and continue.
     - If the cable connections match the planning data, then there was a mistake in the planning data that will need to be corrected.
  3) **Faulty**: Review the switch cable planning data. If the connection card is cabled correctly, run switch diagnostics (refer to “Switch diagnostics” on page 177) and replace FRUs as specified. After this service action, refresh the GUI, verify the fix, and continue.

     Note: If you have a physical location code for the faulty port, you can ignore the first two steps of the switch diagnostic procedure and start with step 3 of that procedure.

– ″No Signal″ as a status for switch chip ports 0, 1, 2, or 3, refer to “Network status codes on HPSNM” on page 271 and follow the instructions for `Down:No Signal` in Table 54 on page 271

3. If the Switch Topology View display does not show any *unexpected* errors, go to “Verify SNI chip ports” and use the End-Point View in HPSNM and verify that all SNIs are present

   Note: Blank Switch Port Connection cards that are in the proper location will display bad status in the Switch Topology View. However, these errors are expected and can be ignored.

Verify SNI chip ports:

SNI chip ports

The SNI chip ports referred to in this task are used to route network traffic through the SNI. Each SNI has one chip for each external SNI port (switch cable connection ports). Therefore a 2-Link SNI has two communication chips and a 1-Link SNI has one. Each SNI chip has two ports: port 0 and port 1. SNI chip port 0 connects to the external SNI port and SNI chip port 1 is used for communication between the other SNI chips in that device.

From the End-Point View, check the status of the CECs and SNIs associated with each server:

1. Open the ″End-Point View″ panel
2. From the main menu, click ″File″
   - From the drop down menu, select ″Expand All″
3. From the main menu, click ″Filter″
   a. From the drop down menu, select ″Edit Filter″
   b. Select ″Port Status″
   c. If this is:
      - The first time through this procedure, select ″Not Operational″ as the filtering criteria
      - The second time through this procedure, select ″Svc Required″ as the filtering criteria
4. Check the status of chip port 1 on all SNIs:
   - If the status of any SNI chip port 1 is reported as ″Not Operational″ or ″Svc Required,″ replace the associated SNI. After this service action, refresh the GUI, verify the fix, and continue.
   - If the display **does not** show a status of ″Not Operational″ or ″Svc Required″ for any SNI chip port 1, continue with step 5.

5. Check the status of chip port 0 on all SNIs:
   - If the display **does not** show status of ″Not Operational″ or ″Svc Required″ for any SNI chip port 0, continue with "Step 1: Define LPARs and assign adapters" on page 106
   - If the status of any SNI chip port 0 is reported as ″Not Operational″ or ″Svc Required,″ continue with step 6.
6. If the display shows a status of ″Not Operational″ or ″Svc Required″ for SNI chip port 0, this indicates three possible conditions:
   a. **Empty**: There is an SNI slot that is empty or not cabled. You will need to review the switch cable planning data and determine whether or not that slot was supposed to have an SNI installed.
      - If the slot is empty and this matches the planning data, ignore this error and continue.
      - If the planning data shows that the slot should not be empty, install or re-cable the SNI as required. After this service action, refresh the GUI, verify the fix, and continue.
   b. **Miswire**: Review the switch cable planning data for that SNI
      - If the cable connections on the SNI do not match the planning data, re-cable the ports as needed. After this service action, reboot the server CEC (refer to "Managed system power on and power off (LPAR reboot)" on page 159) and repeat step this procedure from the beginning (step 1)
      - If the cable connections match the planning data, then there was a mistake in the planning data that will need to be corrected.
   c. **Faulty**: Review the switch cable planning data. If the SNI is cabled correctly, run diagnostics (refer to "Switch diagnostics" on page 177) and replace FRUs as specified. After this service action, refresh the GUI, verify the fix, and continue.

      Note: If you have a physical location code for the faulty port, you can ignore the first two steps of the switch diagnostic procedure and start with step 3 of that procedure.
7. When you have verified that all SNI hardware is present, continue with "Task 2: Verify the availability of system resources"

Task 2: Verify the availability of system resources: During this task, you will use HPSNM to verify that the operating system can access system resources. During this part of the network inspection you will:

1. "Verify availability of SNI resources"
2. "Verify availability of CPU resources" on page 121
3. "Verify availability of memory resources" on page 121

Verify availability of SNI resources: The previous procedures in this section verified that the links are available to the network and that the SNIs are functional. However, you also need to check the availability of all SNI resources by verifying:

1. SNI cabling
2. That all SNIs are visible to the LPARs
3. The SNIs are available to the LPARs
4. That the SNI numbering and `netid` are valid across the network
5. ml0 configuration on all LPARs

Note: If you do not complete these verifications, the hardware may appear to be functional but the SNIs may not be available for communication or communication may be intermittent.

The SNI verification tasks require `dsh` and `lsdev` commands. In these tasks, the `dsh` command allows access to multiple system LPARs. Therefore, the System Administrator **must** execute the `dsh` commands. In conjunction with the `dsh` command, the `lsdev` command accesses information about the SNIs in each LPAR. A system response of `Defined` or `Available` from the `lsdev` command indicates the availability of an SNI.

Note: Because the `lsdev` command relies on the `dsh` command, you must make certain that all LPARs are accessible to the `dsh -av` command.

From the CSM Management Server:

1. Verify SNI cabling
   a. Open the topology map file: `/var/opt/csm/hpsnm/log/topology.map`
   b. In that file, search for the following text: ″inconsistently cabled adapters″
      - If there is a problem, the search string should find information in the topology file stating that: `There are X inconsistently cabled adapters` where X is the number of SNIs with errors
   c. Record the locations for any inconsistently cabled SNIs (adapters)
   d. If:
      - All SNIs are cabled correctly, continue with step 2
      - Any SNIs are reported as ″inconsistently cabled,″ continue with this procedure
   e. Open the HPSNM Endpoint View panel
   f. Look up the frame, cage, and chip for the listed SNIs and cross-reference that information to the physical location listed for the SNIs on the Endpoint View panel
   g. Highlight the SNI on the Endpoint View panel
   h. On the Menu bar, click ″Selected-Properties″
   i. Record the network number for the SNI
   j. Check the cabling information provided in the planning data and re-cable each SNI to the correct location

      Notes:
      1) Check to see if an entire switch was wired into the wrong network. If a switch is miswired, all SNIs connected to that switch will show up as cabled inconsistently.
      2) All corresponding SNI ports on each SNI must be located on the same network. If the planning data indicates that an SNI is cabled correctly, the cable planning must be redone.
   k. After making the required cable changes, check for new errors on HPSNM and in the SFP error logs
   l. If there are no new errors, continue with step 2
2. Verify that all SNIs are visible to the LPARs
   a. Have the System Administrator run the command: `dsh -av "lsdev -Cc adapter | grep sn" | wc -l`
   b. If the number returned by the system:
      - Matches the number of SNIs in the cluster, continue with step 3
      - Does not match the number of SNIs, continue with this procedure
   c. Have the System Administrator run the command: `dsh -av "lsdev -Cc adapter | grep sn" > sni_list`
   d. Open the generated file, `sni_list`, and look at the number of SNIs that are visible to the system
      - SNIs that are visible to the system are listed as `Defined` or `Available`
   e. For each LPAR having SNIs that are not visible, check to see if the SNI was assigned to that LPAR:
      1) Using the HMC GUI on the HMC controlling each server:
         a) Select ″Server and Partition″
         b) Click ″Server Management″
      2) Select the server containing the LPAR that is not reporting an SNI and expand the information
      3) Select the LPAR containing the SNI that is not reporting and expand the information
      4) On the main Menu, click ″Selected-Properties″
      5) Click the ″Hardware″ tab on the dialog box
      6) Click the ″SNI″ tab
      7) If the SNI tab shows that:

- The device was assigned to the LPAR, continue with the sub-step f
- The device **was not** assigned to the LPAR, refer to "Software installation" on page 106 and perform the installation tasks described in "Step 1: Define LPARs and assign adapters" on page 106. After you assign the SNI to the LPAR, return to this location.

8) After you assign the SNI to the correct LPAR, have the System Administrator run the command: `dsh -av "lsdev Cc adapter | grep sn"`
9) If the SNI:
   - Is still **not** visible to the system, continue with the sub-step f
   - Is visible to the system, continue with step 3

f. If you have an SNI that was assigned to an LPAR but the SNI is not visible to the system:
   1) Go to SFP on the HMC controlling each server and review the error logs
   2) Fix any events that are reported against each server or SNIs in that server
   3) Perform the following recovery procedure:
      a) On each server, issue the following command: `mv /usr/sni/aix52/cfgsni /usr/sni/aix52/cfgsni.orig`

         Note: If your system has AIX 5.3 installed, update the command text to aix53.
      b) Reboot the server
      c) For each snix on the server, run the following command: `rmdev -d -l snix`
      d) `mv /usr/sni/aix52/cfgsni.orig /usr/sni/aix52/cfgsni`

         Note: If your system has AIX 5.3 installed, update the command text to aix53.
      e) On each LPAR, run the command: `cfgmgr –s`
   4) Continue with step 3

3. Verify that all SNIs are available to the LPARs
   a. Have the System Administrator run the command: `dsh -av "lsdev -Cc adapter | grep sn | grep Available" | wc -l`
   b. If the number returned by the system:
      - Matches the number of SNIs in the cluster, continue with step 4
      - Does not match the number of SNIs, continue with this procedure
   c. Verify that all servers are powered on
   d. Have the System Administrator run the command: `dsh -av "lsdev -Cc adapter | grep sn | grep -v Available"`
      - This command returns a list of SNIs that are visible to the system but not available
   e. Reboot any LPAR linked to an SNI that is listed as not available
   f. Check SFP and HPSNM for errors related to the links associated with any SNI listed as not available
   g. When all SNIs are listed as available to the operating system, continue with step 4
4. Verify that the SNI numbering and `netid` for all LPARs is consistent across the switch network

   Note: You must verify SNI numbers and netids because previous service actions may have caused an AIX configuration error for these values. AIX assigns the SNI number and `netid` relative to the SNI base address, the slot where the SNI is installed, and where the SNI is cabled into the switch network.
   a. Depending on the version of AIX on the LPAR, run one of the following commands:
      - For AIX 5.3: `for x in 0 1 2 3 4 5 6 7; do echo sni$x; dsh -av "/usr/sni/aix53/debugtools/sni_qry -l sni$x | grep  netid" 2>/dev/null |cut -d":" -f2,3 | uniq -f 3; done`

- For AIX 5.2: `for x in 0 1 2 3 4 5 6 7; do echo sni$x; dsh -av "/usr/sni/aix52/debugtools/sni_qry -l sni$x | grep  netid" 2>/dev/null |cut -d":" -f2,3 | uniq -f 3; done`

Interpreting this command

The previous command checks SNI numbers 0 through 7 on all active LPARs. Although you may not have this many SNIs in any LPAR, you should not change the count value. If you do reduce the counter, some configuration changes may not receive full verification from this command. However, if you have less than eight ″snix″ in each LPAR, you will not see LPAR listings for all ″snix″ counts.

For example: If you have two SNIs in each LPAR (`sni0` and `sni1`), then you should not see an LPAR listing for `sni2`, `sni3`, `sni4`, `sni5`, `sni6`, or `sni7`. However, the output will show each `snix` followed by a list of `netids` used for that `snix`. In addition, the `netid` attribute is also preceded by the number of active LPARs using each `netid`. In other words, if the command returns:

```
sni0
32   netid: 1
sni1
32   netid: 2
```

This indicates that 32 active LPARs are using `netid 1` for `sni0` and 32 active LPARs are using `netid 2` for `sni1`.

About this command

- **`echo sni$x`** outputs a header for each `snix` in the cluster
- **`dsh`** returns the `netid` for each `snix` in active LPARs that can be reached by `dsh -av`
- **`cut`** strips off the LPAR name from the `dsh` output
- **`uniq`** looks at the `netid` output from `dsh` and provides a count of all active LPARs with the same `netid` for each `snix`
- If all SNIs are cabled correctly and the netids are configured correctly, the output should only return one `netid` for each `snix` heading. However, if there is a problem, you will get more than one `netid` listed for that `snix` heading.
- You can use the LPAR count information to:
  – Check that you have the correct number of LPARs with `snix` configured
  – Get an idea of how many LPARs have an `snix` configured with the wrong `netid`

b. The output from this command indicates:

- The SNIs are numbered correctly if all `snix` returns list one `netid`

  Correct configuration example:

  – The system has `node1`, `node2` and `node3` with `sni0` and `sni1` on each node. Each `sni0` should have `netid 1` and each `sni1` should have `netid 2`.

  – The output for the correct configuration would be:

```
sni0
3 netid: 1
sni1
3 netid: 2
sni2
sni3
sni4
sni5
sni6
sni7
```

Notes:

1) The output shows that there are three active LPARs with `netid: 1` (for `sni0`) and three active LPARs with `netid: 2` (for `sni1`).

2) If the system was configured with a single network, the output for sni1 would be 3 netid: 1 instead of 3 netid: 2.

- A problem exists if any snix lists more that one netid

Incorrect configuration example:

– The system should have the same configuration as in the previous example. However, in this configuration the netid for the SNIs on node2 are reversed. In other words, on node2 sni0 has netid 2 and sni1 has netid 1.

– The output for this configuration would be:

```
sni0
2 netid: 1
1 netid: 2
sni1
1 netid: 2
2 netid: 1
sni2
sni3
sni4
sni5
sni6
sni7
```

Note: The output shows that the system has the following problems:

– sni0 has a problem because that snix has two active LPARs with netid: 1 and one active LPAR with netid: 2

– sni1 has a problem because that snix has two active LPARs with netid: 2 and one active LPAR with netid: 1

c. If the previous dsh command:

- Does not indicate a problem, continue with step 5
- Indicates an SNI problem, continue with this procedure and find the specific SNIs with problems

d. To find the specific SNIs with problems, make the text substitutions described below and run the following command: `dsh -av "/usr/sni/aix52/debugtools/sni_qry snix | grep \"netid: [wrong network]\""`

Text substitutions:

- If your system has AIX 5.3 installed, update the command text to aix53
- The value entered for ″x″ in snix is the SNI number with multiple adapters
- The value entered for [wrong network] is the netid for the SNI that is configured with the incorrect netid
- *For example:* if sni0 should be on network 1 but it is on network 2, use the following text for this command: `dsh -av "/usr/sni/aix52/debugtools/sni_qry sni0 | grep \"netid: 2\""`

Note: This command returns a list of LPARs with problem SNIs.

e. Perform the following recovery procedure on each LPAR listed as having a problem:

1) Save the SNI configuration information by running the command: `mv /usr/sni/aix52/cfgsni /usr/sni/aix52/cfgsni.orig`

Note: If your system has AIX 5.3 installed, update the command text to aix53.

2) Reboot the server

3) For each snix on the server, run the command: `rmdev -d -l snix` where x is the SNI number

4) Restore the SNI configuration information by running the command: `mv /usr/sni/aix52/cfgsni.orig /usr/sni/aix52/cfgsni`

Note: If your system has AIX 5.3 installed, update the command text to aix53.

5) On each LPAR, run the command: `cfgmgr -s`
6) Continue with step 5

5. Verify that ml0 is configured on all LPARs and that the system recognizes all LPARs
   a. Have the System Administrator run the command: `dsh -av "netstat -in | grep ml0 | grep -v link | egrep -v 'ml0\*'" | wc -l`
   - If the number of LPARs with ml0 returned by this command matches the number of LPARs in the cluster, continue with "Verify availability of CPU resources"
   - If the returned number does not match the number of LPARs:
     1) Make certain that all LPARs are booted and operational
     2) Have the System Administrator run the command: `dsh -av "netstat -in | grep ml0 | egrep 'ml0\*'"`
        – This command returns a list of LPARs with ml0 configuration problems
        – Reboot the listed LPARs
        – Check SFP and the HPSNM GUI for errors related to the link associated with the LPAR
     3) When all LPARs are recognized by the operating system, continue with "Verify availability of CPU resources"

Verify availability of CPU resources: After checking SNI availability, you need to verify all CPU resources. If these resources are not available, system performance will be less than optimal. To verify the availability of CPU resources:

1. Run the command `dsh -av "lsdev -C | grep proc | grep Available" | wc -l`
2. This command should return the total number of processors available in the cluster, if it does not:
   a. Verify that all servers are powered on
   b. Fix any problems with `dsh` not being able to reach all LPARs
   c. Determine which processors are having problems by running the command `dsh -av "lsdev -C | grep proc | grep -v Available"`
   d. After you have identified the problem CPUs, check SFP on the HMC controlling the server and complete the required service actions
   e. When all CPUs are available, continue with the procedure to "Verify availability of memory resources"

Verify availability of memory resources: After checking CPU resource availability, you need to verify all memory resources. If these resources are not available, system performance will be less than optimal. To verify the availability of memory resources:

1. Run the command `dsh -av "lsattr -E -l mem0 | awk '{ if (\$1 ~/goodsize/ ) { g=\$2} else { p=\$2 }}END{d=p-g; print d}'" | grep -v ": 0"`

   Note: The result of the `awk` is the difference between physical memory and available memory. Unless there is deconfigured memory, if you drop the `grep -v ": 0"`, every LPAR should return 0 (zero).

2. If:
   - The operating system has access to all memory resources, the system will return you to a command prompt without returning data
   - Memory requires configuration, check SFP on the HMC controlling the server LPAR and service as instructed

     Note: Before you perform a memory service action, make certain that the memory was not deconfigured for a specific reason.

3. When the system reports all memory resources are available, continue with "Task 3: Run the host-based verification tools" on page 122

Task 3: Run the host-based verification tools: After you have verified and configured the network hardware, you must exercise the network by running low-stress and high-stress software tests. These tests place loads on the network to expose residual problems that may cause lost messages. If these tests find message passing errors, the results get written to a file that you define.

AIX installation requirement

Before you can run the host based verification tools and report installation complete, the customer must install AIX on the system. Depending on the time required for AIX installation, you may have to schedule a return trip to the customer site to complete the installation.

Running the host-based verification tools consists of three tasks:

1. "Creating the network address file"
2. "Running the low-stress test"
3. "Running the high-stress test" on page 123

Creating the network address file:

Attention: This procedure creates an address file for one network. If you are working on a two network system, you must create two address files. Each file must only contain addresses for the SNIs on one network. In addition, you must run the verification tests individually against each address file.

Depending on the version of AIX installed, the host-based verification tools are located in either `/usr/sni/aix52` or `/usr/sni/aix53`. Before you can run these tests, you must create a file with address information for each SNI.

Note: In this step you will create one address file that will contain all entries. After you create that file, you **must** execute the stress tests from the LPAR where you stored that file.

To create the address file:

1. Open a telnet session on the HMC
2. Log on to one of the system LPARs as root
3. Depending on the version of AIX installed, change directory to `/usr/sni/aix52` or `/usr/sni/aix53`
4. Collect the following information for each SNI:
   - The Ethernet names or addresses of each LPAR with an SNI installed (for example: `c62f3rp01`)
   - The device name for each SNI (for example: `/dev/sni0`)
   - The IP address for each SNI external port (for example: `9.111.10.120`)
5. Using the information collected in step 4, create the network address file:
   - Each line in the addresses file contains the information about one SNI
   - The format of each line is: `ethernet_address device switch_address`

     For example:

     ```
     c62f3rp01 /dev/sni0 9.111.10.120
     c62f3rp01 /dev/sni1 9.111.10.121
     c62f3rp01 /dev/sni3 9.111.10.122
     ```
   - Depending on the version of AIX installed, name the file and save it to either `/usr/sni/aix52` or `/usr/sni/aix53`
     – Use `addresses_file_net1` for network 1
     – Use `addresses_file_net2` for network 2 (if required)

   Note: Enter the Ethernet, SNI, and switch information carefully. The accuracy of the stress test results depends on the accuracy of the information entered in the network addresses file.

Running the low-stress test:

Attention: If this is a two network system, you must run this test individually against each network address file.

Verify that all links can be used for message traffic by running the low-stress version of the verification tool:

1. If not already active, open a telnet session on either the HMC, the Management Server, or a connected workstation and log on to a system LPAR as root
2. Depending on the version of AIX installed, change directory to either `/usr/sni/aix52` or `/usr/sni/aix53`
3. From the LPAR directory, issue the following command: `./verification_test -a addresses_file -c test1 -o output_file_t1`

   Notes:

   a. The time requirement for the low-stress test is variable. However, this test normally takes between five and thirty minutes to complete. If you are running this test on an extremely large cluster, this test can run even longer. For extremely large clusters, contact the next level of support for variable changes that can reduce run time.
   b. `addresses_file` is the user defined file created in step 5.
   c. `output_file_t1` is the user defined file name to which the system will write the low-stress test results.
   d. Lost messages are flagged as errors and a description using the information in `addresses_file` gets added to `output_file_t1`.
      - For example:

        ```
        Messages were lost between the following adapter pairs.
        Please check Service Focal Point to see if it contains information about the errors.
        0->1 c62f3rp01,9.111.10.120->c62f3rp02,9.111.10.130 lost 1% of its messages.
        0->2 c62f3rp01,9.111.10.120->c62f3rp03,9.111.10.131 lost 1% of its messages.
        ```
   e. If any messages are lost across any route, the network cannot be reported as Installation Complete. If `output_file_t1` reports lost messages, continue diagnostic procedures until all messages are successfully transferred.
4. Using the following sources, look for information that refers to components associated with the network data reported in `output_file_t1`. If one source does not have component references, check the next source using the order listed:
   a. The Service Focal Point error log on the ELA Master HMC running HPSNM
   b. The Service Focal Point error log on the HMC managing the servers with the listed SNIs installed
   c. From the Management Server, use the HPSNM End-Point View and look at the status for the ports corresponding to the SNIs listed in the error messages
5. If:
   - You find errors resulting from the low-stress test:
     – Fix errors as indicated
     – Continue running the low-stress test and fixing errors until the test completes without errors
   - The low-stress test completes without reporting errors, continue with this procedure by “Running the high-stress test”

Running the high-stress test:

Attention: The high-stress test takes approximately thirty minutes to complete.

Attention: If this is a two network system, you must run this test individually against each network address file.

Test the switch links by running the high-stress version of the verification tool:

1. If not already active, open a telnet session on either the HMC, the Management Server, or a connected workstation and log on to a system LPAR as root

2. Depending on the AIX version installed, change directory to either `/usr/sni/aix52` or `/usr/sni/aix53`
3. From the LPAR directory, issue the following command:

   ```
   ./verification_test -a addresses_file -c test2 -o output_file_t2
   ```
   a. On the ELA Master HMC, check Service Focal Point for errors and take any needed repair actions
   b. Repeat the high-stress version of the verification tool until the SFP error log does not display errors associated with this test

When both of the following conditions are met, continue with "Step 4: Setting HPSNM to Normal Operation Mode and reporting Installation Complete":

- The HPSNM GUI does not have any *unexpected* errors (status of Not Operational or Svc Required) in either the Switch Topology View and End-Point View
- Service Focal Point does not list any events having a switch or SNI in the associated FRU lists

Note: If the high-stress test reports errors or serviceable events, fix errors as indicated. After completing the service procedure, you must rerun **both** the low-stress and the high-stress tests. Both tests must complete without error before you continue with "Step 4: Setting HPSNM to Normal Operation Mode and reporting Installation Complete."

Step 4: Setting HPSNM to Normal Operation Mode and reporting Installation Complete

1. On the HPSNM Network Management panel, click ″Disable HPSNM software″
2. When the dialog box opens, select ″Yes″ to disable the network manager
3. Return to the HPSNM Network Management panel
4. Refresh the display
5. Click ″Enable HPSNM software for Normal Operation″
6. When the dialog box opens, select ″Yes″ to enable the network manager for normal operation

   Note: Make certain that you select the option for Normal Operation and not the option to ″Enable HPSNM Software for Switch Network Verification.″
7. You have verified the network if:
   a. You have successfully completed Steps 1, 2, and 3
   b. You have brought the network online with HPSNM in Normal Operation Mode
8. After you have verified the network you can report *Installation Complete* (Service Code 20 in the U.S.)

Chapter 7. Maintenance Analysis Procedures (MAPs)

Maintenance Analysis Concepts

In an HPS cluster, serviceable events get created by multiple entities. In addition, each entity also reports problems to different locations on the cluster. In order to collect all the information related to a specific error, you must understand how each event gets created and reported.

- The service processor on the server creates serviceable events and reports problems that are:
  - Internal to the server
  - For I/O drawers attached to a server
  - Internal SNI problems (does not include SNI link or SNI network problems)
- The BPA service processor creates serviceable events and reports problems for frame power events
- HPSNM creates serviceable events and reports problems that are:
  - HPS related
  - For SNI link errors (does not include internal SNI problems)
  - For SNI network errors (does not include internal SNI problems)

Because each type of serviceable event gets reported by a different entity, you must look in different locations for each report. For events reported by:

Any service processor
Refer to SFP on the HMC controlling the server or BPA that created the event

HPSNM
Refer to SFP on the ELA Master HMC
- Events reported to the ELA Master HMC are replicated across all HMCs in the cluster, however there will be a time lag before other HMCs receive that information

CAUTION:
Servicing of this product or unit is to be performed by trained service personnel only. (C032)

This chapter provides information for identifying problems and guides you to the most likely failed Field Replaceable Unit (FRU). The MAPs then refer you to the FRU Removal and Replacement procedures for the corrective action.

- “Starting a service call (MAP 0100)”
- “End of call” on page 140

Attention: HPS network components have built-in redundancies that provide high availability service. Because of these design features, a link may appear operational even though it has a serviceable event posted against it. Under these conditions, you should perform the service actions for the reported event. Although you may be able to defer maintenance, the network may experience degraded performance until the service actions are complete.

Starting a service call (MAP 0100)

Purpose of this MAP

The MAPs in this section provide information for identifying problems and guides you to the most likely failed Field Replaceable Unit (FRU). The MAPs then refer you to the FRU removal or replacement procedures for the corrective action.

When possible, run diagnostics from High Performance Switch Network Manager (HPSNM). HPSNM diagnostics perform additional functions, compared to standalone diagnostics. This ensures that the error state of the system that was captured in NVRAM is available for your use in fixing the problem. The AIX error log and SMIT are only available when diagnostics are run from the hard drive. Always check Service Focal Point for any open service events in Service Action Event log.

Attention: Components are susceptible to damage from static discharge. Always use an ESD wristband when working inside frame covers. (See "Personal ESD requirements" on page 152 for more details.) Do not touch the pins or circuitry on these components.

Note: Licensed programs frequently rely on system information stored in the VPD module in the processor subsystem. If the MAPs indicate that the VPD module should be replaced, swap the old VPD module from the processor subsystem with a new VPD module. If the VPD module has to be replaced, call technical support for recovery instructions. If recovery is not possible, notify the system owner that new keys for licensed programs may be required.

MAP 0100 Start service call

Avoiding miswires during diagnostic procedures

If you exchange cables between SNI ports during a diagnostic procedure, you are likely to cause a miswire on a dual network cluster. If you must exchange cables for fault isolation, you should swap them at the switch end using this set of rules:

- You can only exchange cables that are used for server-to-switch connections
  - Exchanging switch-to-switch cables will always result in a miswire
- **Do not** exchange switch cables at the ports on the SNI (server) end of the cable
- All cable exchanges **must** be done using the ports on the SPC cards
- **Do not** exchange cables used for switch-to-switch connections
  - Exchanging switch-to-switch cables will always result in a miswire
- Only exchange cables that are attached to the same switch
  - Exchanging cables attached to different switches may place SNI connections on different networks
- After exchanging cables, check the Switch Topology GUI and verify that those links show a status of Up:Operational
  - If any links are not Up:Operational, follow standard diagnostic procedures

After any repair action or fault isolation procedure that affects links, you should check the Switch Topology panel and the End-Point panel on the HPSNM GUI. Using those panels make sure that all links show a status of Up:Operational. If any links are not Up:Operational, follow standard diagnostic procedures.

Notes:

1. If you must exchange cables between SNI ports, you must reboot the LPARs associated with the SNIs. This requirement is a function of how HPSNM initializes and updates network routes. To minimize changes across the cluster, the system associates physical IDs with the switch endpoint and not with the SNI. Therefore, if you exchange cables at the SNI, you have also exchanged physical IDs and that may require an LPAR reboot to correct. If you need to reboot one or more LPARs, you **must** refer to the instructions in "Managed system power on and power off (LPAR reboot)" on page 159.
2. If you have exchanged cables between SNI ports, the status for those ports on the HPSNM GUI should be ″Down:Re-cable.″
3. **Never** exchange switch-to-switch cables. This will always result in a miswire.

Attention: HPS network components have built-in redundancies that provide high availability service. Because of these design features, a link may appear operational even though it has a serviceable event posted against it. Under these conditions, you should perform the service actions for the reported event. Although you may be able to defer maintenance, the network may experience degraded performance until the service actions are complete.

Table 18. Service entry points

Symptom	Starting Point
You have an error code of the form BBXXXXXX	Go to Appendix A, "FRU identification codes," on page 239
SFP lists an error code having a form other than BBXXXXXX	Use the ″Repair Serviceable Events″ function in SFP and follow the displayed procedures
The ″Switch Topology View″ or ″Endpoint View″ panels on HPSNM report a status problem	Go to Table 54 on page 271 and look up the reported status
The HPS network has performance problems or difficulties maintaining SNI availability	Go to "HPS quick entry MAP" on page 128
All server or I/O drawer problems that **are not** related to an SNI	Refer to the server specific service information provided with that component

The various codes that might display on the HMC are all listed as error codes by SFP. To assist you in identifying the types of error data in this guide, use Table 19.

Table 19. Service Focal Point error codes

SFP Name	Number of digits in error code	Error code	Name used in this service guide
Error Code	Any	Contains hash mark (#)	Menu goal
	Any	Contains hyphen (-)	SRN
	5	Does not contain either # or -	SRN
	6	Does not contain either # or -	Error code
	8	Does not contain either # or -	Error code, SRC, or reference code

HPS quick entry MAP

Quick Entry MAP Table of Contents

Table 20. Quick entry MAPs

Problem description	Page
Service actions	Table 21
8-digit error codes	Table 22
Hardware Management Console (HMC) problem	Table 23 on page 129
Other symptoms or problems	Table 24 on page 129

Attention:

- If you replace FRUs and the problem is still not corrected, go to “MAP 1020: Problem determination” on page 136 unless you were already directed to another location by an error code.
- Call for service support if the actions for an error code do not resolve the problem.
- If you replace FRUs or perform a service action and the problem is corrected, go to “End of call procedures (MAP 0650)” on page 140.

Table 21. Quick entry MAP: Service Actions

Service Actions	
Symptom	**Action**
You have an open service event in the service action event log	Go to ″Service Focal Point″ in the *Hardware Management Console for pSeries Maintenance Guide*.
You have parts to exchange or a corrective action to perform	1. Go to Chapter 10, “FRU removal and replacement procedures,” on page 203 2. Go to “End of call procedures (MAP 0650)” on page 140
You need to verify that a part exchange or corrective action corrected the problem	Go to “End of call procedures (MAP 0650)” on page 140
You need to verify correct system operation	Go to “End of call procedures (MAP 0650)” on page 140
On the HMC, the system status is ″disconnected″	1. Check all of the HMC connections to the system 2. Go to specific server or system service documentation and address the problems

Table 22. Quick entry MAP: 8-digit error codes

8-digit error codes	
Symptom	**Action**
You have an 8-digit BBXXXXXX error code displayed	1. Look up the error code using the tables in Appendix A, “FRU identification codes,” on page 239. 2. Look up the service action event (SAE) log. If the FRU has been changed other than the one in step 1, look at the most recent one.

Table 23. Quick entry MAP: HMC problems

Hardware Management Console (HMC) Problems	
Symptom	**Action**
Hardware Management Console (HMC) cannot be used to manage a managed system, or the connection to the managed system is failing.	If the managed system is operating normally (no error codes or other symptoms), the HMC might have a problem, or the connection to the managed system might be damaged or incorrectly cabled. Do the following: 1. Check the BPA connection between the HMC and the managed system. Correct any cabling errors if found. If another Ethernet cable is available, connect it in place of the existing cable and refresh the HMC graphical user interface. You may have to wait up to 30 seconds for the managed system to reconnect. 2. Verify that any connected HMC is connected to the managed system by checking the Management Environment of the HMC. **Note:** The managed system must have power connected and the system running, or waiting for a power-on instruction (the `OK` prompt is in the operator panel value on the HMC.) If the managed system does not appear in the Navigation area of the HMC Management Environment, then the HMC or the connection to the managed system might be failing. 3. Go to the Entry MAP in the *Hardware Management Console for pSeries Maintenance Guide*. 4. If you cannot fix the problem using the HMC tests in the *Hardware Management Console for pSeries Maintenance Guide*, there might be a problem with the service processor card; replace the service processor card, location: Umt.m.sn-Px-Xy (where mt = machine type, m = model, and sn = serial number).
HMC cannot call out using the attached modem and the customer's telephone line.	If the managed system is operating normally (no error codes or other symptoms), the HMC might have a problem, or the connection to the modem and telephone line may have a problem. Do the following: 1. Check the connections between the HMC and the modem and telephone line. Correct any cabling errors if found. 2. Go to the Entry MAP in the *Hardware Management Console for pSeries Maintenance Guide*.

Table 24. Quick entry MAP: Other problems

Other problems	
Symptom	**Action**
You suspect a bad port	Go to "Faulty port diagnostics" on page 178 in the service procedures to analyze the problem
You have an SPC card with a green LED flashing on a port that has a cable	Go to "SPC card LED problem" on page 130
You have an SPC card that does not have any green LEDs lit	Go to "SPC card LED problem" on page 130
You have an SNI with a status making it unavailable	Go to "SNI link availability problem" on page 130
You have a ml0 with a status making it unavailable	Go to "SNI link availability problem" on page 130
The HPS network is having performance problems	Go to "HPS network performance problem" on page 131

Table 24. Quick entry MAP: Other problems (continued)

Other problems	
Symptom	**Action**
All other problems	Go to “MAP 1020: Problem determination” on page 136

SPC card LED problem:

Before you begin:

To determine the location code for an SPC card

1. From the switch enclosure, obtain the MTMS for the switch with the SPC card
2. Determine the SPC card position; numbering begins at 1 at the left and ends at 16 at the right
3. The SPC card location code = U[switch machine type].[switch model].[switch serial number]-P1-C[SPC card position]
4. The port location code is: U[switch machine type].[switch model].[switch serial number]-P1-C[SPC card position]-T[port]

Determine which of the following LED states applies the SPC card reporting the problem:

- If one green LED is unlit and the other is either flashing or lit but not flashing, replace the SPC card
- If both green LEDs are not lit, check the switch power
  - If switch power is off:
    1. Determine if the power is off for a valid reason
    2. If appropriate, turn the switch power on
    3. If the green LEDs are still unlit, replace the SPC card
  - If switch power is on:
    1. Re-seat the SPC card
    2. If the green LEDs are still unlit, replace the SPC card
- If both LEDs are lit but one or both of the LEDs are flashing:

  Note: If both LEDs are flashing and the following procedure indicates a faulty FRU rather than a configuration or power problem, then the SPC card is probably not the failing FRU.

  1. Review the SFP error logs on the ELA Master HMC for the location code of the SPC card with the LED problem and perform the appropriate service action for the reported event.
     - If SFP does not have a reported event, continue with step 2.
  2. Using the port location code, check the High Performance Switch Network Manager ″Switch Topology″ panel for the status of that port. If the port has any status other than ″Up:Operational,″ refer to Table 54 on page 271 in Appendix A and perform the procedure for the reported status.
     - If the ″Switch Topology″ panel does not list a port fault, continue with step 3.
  3. Refer to “Service actions for ″Down:No Signal″” on page 274 in Appendix A and perform the associated procedure.

     If the SPC card still shows an LED problem, call the next level of support.

SNI link availability problem: If you have a link availability problem and the output from the command `lsdev -C | grep sniX` reports any sniX adapters as not available, perform the following procedure:

Note: You may require assistance from the System Administrator for certain steps in the procedure. Please identify these requirements and notify the System Administrator before proceeding.

1. On the partition with the link problem, run the command `lscfg -vp -l sniX`
   - X = the SNI number in the partition
2. If it is available from the `lscfg` command, record the physical location of the SNI
   - If the physical location for sniX is not listed, call the next level of support

3. For that location code, check the SFP ″Select Serviceable Events″ panel on both the HMC controlling the server with the SNI and on the ELA Master HMC
   - Perform the appropriate service actions for the SFP event reporting the SNI in the FRU list
   - If SFP does not list any serviceable events, continue with the next step
4. Open HPSNM and check the status for the SNI location code in the ″End-Point View″ panel
   - If the SNI has any status other than ″Up:Operational,″ refer to Table 54 on page 271 in Appendix A and perform the procedure for the reported status
   - If the End-Point View does not report a status fault, continue with the next step
5. Have the System Administrator check SNI addresses and configuration settings; if there are not any configuration errors, call the next level of support

HPS network performance problem: Use this procedure to eliminate network performance problems:

Note: Before you begin this diagnostic procedure, make certain that system configuration followed the procedures described in Appendix C, “HPS network configuration,” on page 305 and Appendix D, “Cabling the HPS,” on page 337. If those procedures were not followed, the network will experience performance degradation and packet loss. If the performance problems are severe, the customer will have to determine the proper connection endpoints and re-cable the network.

1. Check SFP on **all** HMCs in the cluster and perform the appropriate service actions for any open events
2. On the HPSNM GUI:
   a. Check the ″Switch Topology View″ for any status that is not ″Up:Operational″ and not ″Down:No Signal″
   b. Go to Table 54 on page 271 in Appendix A and perform the appropriate procedures for the reported status
   c. Check the Endpoint View for any status that is not ″Up:Operational″ and not ″Down:No Signal″
   d. Go to Table 54 on page 271 in Appendix A and perform the appropriate procedures for the reported status
3. Verify the availability of all SNI resources:

   Verify SNI cabling

   a. On the CSM Management Server, open the topology map file: `/var/opt/csm/hpsnm/log/topology.map`
   b. In that file, search for the following text: ″inconsistently cabled adapters″
      - If there is a problem, the search string should find information in the topology file stating that: `There are X inconsistently cabled adapters` where X is the number of SNIs with errors
   c. Record the locations for any inconsistently cabled SNIs (adapters)
   d. If:
      - All SNIs are cabled correctly, continue with the procedure to Verify SNIs are visible to the LPARs
      - Any SNIs are reported as ″inconsistently cabled,″ continue with this procedure
   e. Open the HPSNM Endpoint View panel
   f. Look up the frame, cage, and chip for the listed SNIs and cross-reference that information to the physical location listed for the SNIs on the Endpoint View panel
   g. Highlight the SNI on the Endpoint View panel
   h. On the Menu bar, click ″Selected-Properties″
   i. Record the network number for the SNI
   j. Check the cabling information provided in the planning data and re-cable each SNI to the correct location

Notes:

1) Check to see if an entire switch was wired into the wrong network. If a switch is miswired, all SNIs connected to that switch will show up as cabled inconsistently.
2) All corresponding SNI ports on each SNI must be located on the same network. If the planning data indicates that an SNI is cabled correctly, the cable planning must be redone.

k. After making the required cable changes, check for new errors on HPSNM and in the SFP error logs

l. If there are no new errors, continue with the procedure to Verify SNIs are visible to the LPARs

Verify that all SNIs are visible to the LPARs

a. Have the System Administrator run the command: `dsh -av "lsdev -Cc adapter | grep sn" | wc -l`

b. If the number returned by the system:
   - Matches the number of SNIs in the cluster, continue with the procedure to verify that all SNIs are available to the LPARs
   - Does not match the number of SNIs, continue with this procedure

c. Have the System Administrator run the command: `dsh -av "lsdev -Cc adapter | grep sn" > sni_list`

d. Open the generated file, `sni_list`, and look at the number of SNIs that are visible to the system
   - SNIs that are visible to the system are listed as `Defined` or `Available`

e. For each LPAR having SNIs that are not visible, check to see if the SNI was assigned to that LPAR:
   1) Using the HMC GUI on the HMC controlling each server:
      a) Select ″Server and Partition″
      b) Click ″Server Management″
   2) Select the server containing the LPAR that is not reporting an SNI and expand the information
   3) Select the LPAR containing the SNI that is not reporting and expand the information
   4) On the main Menu, click ″Selected-Properties″
   5) Click the ″Hardware″ tab on the dialog box
   6) Click the ″SNI″ tab
   7) If the SNI tab shows that:
      - The device was assigned to the LPAR, continue with the sub-step f
      - The device **was not** assigned to the LPAR, refer to “Software installation” on page 106 and perform the installation tasks described in “Step 1: Define LPARs and assign adapters” on page 106. After you assign the SNI to the LPAR, return to this location.
   8) After you assign the SNI to the correct LPAR, have the System Administrator run the command: `dsh -av "lsdev Cc adapter | grep sn"`
   9) If the SNI:
      - Is still **not** visible to the system, continue with the sub-step f
      - Is visible to the system, continue with the procedure to verify that all SNIs are available to the LPARs

f. If you have an SNI that was assigned to an LPAR but the SNI is not visible to the system:
   1) Go to SFP on the HMC controlling each server and review the error logs
   2) Fix any events that are reported against each server or SNIs in that server

3) Perform the following recovery procedure:
   a) On each server, issue the following command: `mv /usr/sni/aix52/cfgsni /usr/sni/aix52/cfgsni.orig`

      Note: If your system has AIX 5.3 installed, update the command text to aix53.
   b) Reboot the server
   c) For each snix on the server, run the following command: `rmdev -d -l snix`
   d) `mv /usr/sni/aix52/cfgsni.orig /usr/sni/aix52/cfgsni`

      Note: If your system has AIX 5.3 installed, update the command text to aix53.
   e) On each LPAR, run the command: `cfgmgr –s`
4) Continue with the procedure to verify that all SNIs are available to the LPARs

Verify that all SNIs are available to the LPARs

a. Have the System Administrator run the command: `dsh -av "lsdev -Cc adapter | grep sn | grep Available" | wc -l`
b. If the number returned by the system:
   - Matches the number of SNIs in the cluster, continue with the procedure to verify SNI numbering and the `netid` for LPARs
   - Does not match the number of SNIs, continue with this procedure
c. Verify that all servers are powered on
d. Have the System Administrator run the command: `dsh -av "lsdev -Cc adapter | grep sn | grep -v Available"`
   - This command returns a list of SNIs that are visible to the system but not available
e. Reboot any LPAR linked to an SNI that is listed as not available
f. Check SFP and HPSNM for errors related to the links associated with any SNI listed as not available
g. When all SNIs are listed as available to the operating system, continue with the procedure to verify SNI numbering and the `netid` for LPARs

Verify that the SNI numbering and `netid` for all LPARs is consistent across the switch network

Note: You must verify SNI numbers and netids because previous service actions may have caused an AIX configuration error for these values. AIX assigns the SNI number and `netid` relative to the SNI base address, the slot where the SNI is installed, and where the SNI is cabled into the switch network.

a. Depending on the version of AIX on the LPAR, run one of the following commands:
   - For AIX 5.3: `for x in 0 1 2 3 4 5 6 7; do echo sni$x; dsh -av "/usr/sni/aix53/debugtools/sni_qry -l sni$x | grep  netid" 2>/dev/null |cut -d":" -f2,3 | uniq -f 3; done`
   - For AIX 5.2: `for x in 0 1 2 3 4 5 6 7; do echo sni$x; dsh -av "/usr/sni/aix52/debugtools/sni_qry -l sni$x | grep  netid" 2>/dev/null |cut -d":" -f2,3 | uniq -f 3; done`

   Interpreting this command

   The previous command checks SNI numbers 0 through 7 on all active LPARs. Although you may not have this many SNIs in any LPAR, you should not change the count value. If you do reduce the counter, some configuration changes may not receive full verification from this command. However, if you have less than eight ″snix″ in each LPAR, you will not see LPAR listings for all ″snix″ counts.

   For example: If you have two SNIs in each LPAR (`sni0` and `sni1`), then you should not see an LPAR listing for `sni2`, `sni3`, `sni4`, `sni5`, `sni6`, or `sni7`. However, the output will show each `snix` followed by a list of `netids` used for that `snix`. In addition, the `netid` attribute is also preceded by the number of active LPARs using each `netid`. In other words, if the command returns:

```
sni0
32   netid: 1
sni1
32   netid: 2
```

This indicates that 32 active LPARs are using `netid 1` for `sni0` and 32 active LPARs are using `netid 2` for `sni1`.

About this command

- **echo sni$x** outputs a header for each `snix` in the cluster
- **dsh** returns the `netid` for each `snix` in active LPARs that can be reached by `dsh -av`
- **cut** strips off the LPAR name from the `dsh` output
- **uniq** looks at the `netid` output from `dsh` and provides a count of all active LPARs with the same `netid` for each `snix`
- If all SNIs are cabled correctly and the netids are configured correctly, the output should only return one `netid` for each `snix` heading. However, if there is a problem, you will get more than one `netid` listed for that `snix` heading.
- You can use the LPAR count information to:
  - Check that you have the correct number of LPARs with `snix` configured
  - Get an idea of how many LPARs have an `snix` configured with the wrong `netid`

b. The output from this command indicates:

- The SNIs are numbered correctly if all `snix` returns list one `netid`

  Correct configuration example:

  - The system has `node1`, `node2` and `node3` with `sni0` and `sni1` on each node. Each `sni0` should have `netid 1` and each `sni1` should have `netid 2`.
  - The output for the correct configuration would be:

```
sni0
3 netid: 1
sni1
3 netid: 2
sni2
sni3
sni4
sni5
sni6
sni7
```

  Notes:

  1) The output shows that there are three active LPARs with `netid: 1` (for `sni0`) and three active LPARs with `netid: 2` (for `sni1`).
  2) If the system was configured with a single network, the output for `sni1` would be `3 netid: 1` instead of `3 netid: 2`.

- A problem exists if any `snix` lists more that one `netid`

  Configuration problem example:

  - The system should have the same configuration as in the previous example. However, in this configuration the `netid` for the SNIs on `node2` are reversed. In other words, on `node2 sni0` has `netid 2` and `sni1` has `netid 1`.
  - The output for this configuration would be:

```
sni0
2 netid: 1
1 netid: 2
sni1
1 netid: 2
2 netid: 1
sni2
sni3
sni4
sni5
sni6
sni7
```

Note: The output shows that the system has the following problems:

– `sni0` has a problem because that `snix` has two active LPARs with `netid: 1` and one active LPAR with `netid: 2`

– `sni1` has a problem because that `snix` has two active LPARs with `netid: 2` and one active LPAR with `netid: 1`

c. If the previous `dsh` command:
   - Does not indicate a problem, continue with the procedure to verify ml0 configuration and LPAR recognition
   - Indicates an SNI problem, continue with this procedure and find the specific SNIs with problems

d. To find the specific SNIs with problems, make the text substitutions described below and run the following command: `dsh -av "/usr/sni/aix52/debugtools/sni_qry snix | grep \"netid: [wrong network]\""`

   Text substitutions:
   - If your system has AIX 5.3 installed, update the command text to aix53
   - The value entered for ″x″ in `snix` is the SNI number with multiple adapters
   - The value entered for `[wrong network]` is the netid for the SNI that is configured with the incorrect netid
   - *For example:* if sni0 should be on network 1 but it is on network 2, use the following text for this command: `dsh -av "/usr/sni/aix52/debugtools/sni_qry sni0 | grep \"netid: 2\""`

   Note: This command returns a list of LPARs with problem SNIs.

e. Perform the following recovery procedure on each LPAR listed as having a problem:
   1) Save the SNI configuration information by running the command: `mv /usr/sni/aix52/cfgsni /usr/sni/aix52/cfgsni.orig`

      Note: If your system has AIX 5.3 installed, update the command text to aix53.
   2) Reboot the server
   3) For each snix on the server, run the command: `rmdev -d -l snix` where x is the SNI number
   4) Restore the SNI configuration information by running the command: `mv /usr/sni/aix52/cfgsni.orig /usr/sni/aix52/cfgsni`

      Note: If your system has AIX 5.3 installed, update the command text to aix53.
   5) On each LPAR, run the command: `cfgmgr -s`
   6) Continue with the procedure to verify ml0 configuration and LPAR recognition

Verify that ml0 is configured on all LPARs and that the system recognizes all LPARs

a. Have the System Administrator run the command: `dsh -av "netstat -in | grep ml0 | grep -v link | egrep -v 'ml0\*'" | wc -l`

- If the number of LPARs with ml0 returned by this command matches the number of LPARs in the cluster, continue with the procedure to verify the availability of server resources
- If the returned number does not match the number of LPARs:
  1) Make certain that all LPARs are booted and operational
  2) Have the System Administrator run the command: `dsh -av "netstat -in | grep ml0 | egrep 'ml0\*'"`
     – This command returns a list of LPARs with ml0 configuration problems
     – Reboot the listed LPARs
     – Check SFP and the HPSNM GUI for errors related to the link associated with the LPAR
  3) When all LPARs are recognized by the operating system, continue with the procedure to verify the availability of server resources

4. Verify the availability of the server resources:

   Verify CPUs:
   To verify the availability of CPU resources:
   a. Run the command `dsh -av "lsdev -C | grep proc | grep AVAILABLE" | wc -l`
   b. This command should return the total number of processors available in the cluster, if it does not:
      1) Verify that all servers are powered on
      2) Fix any problems with `dsh` not being able to reach all LPARs
      3) Determine which processors are having problems by running the command `dsh -av "lsdev -C | grep proc | grep -v AVAILABLE"`
      4) After you have identified the problem CPUs, check SFP on the HMC controlling the server and complete the required service actions
      5) When all CPUs are available, continue with the procedure to verify memory

   Verify memory:
   To verify the availability of memory resources:
   a. Run the command `dsh -av "lsattr -E -l mem0 | awk '{ if (\$1 ~/goodsize/ ) { g=\$2} else { p=\$2 }}END{d=p-g; print d}'" | grep -v ": 0"`

      Note: The result of the `awk` is the difference between physical memory and available memory. Unless there is deconfigured memory, if you drop the `grep -v ": 0"`, every LPAR should return 0 (zero).
   b. If:
      - The operating system has access to all memory resources, the system will return you to a command prompt without returning data
      - Memory requires configuration, check SFP on the HMC controlling the server LPAR and service as instructed

        Note: Before you perform a memory service action, make certain that the memory was not deconfigured for a specific reason.
5. If the network still has performance problems call the next level of support

MAP 1020: Problem determination

Purpose of this MAP

Use this MAP if:

- Diagnostics fail to run
- High Performance Switch Network Manager (HPSNM) cannot be opened
- HPSNM opens but there are missing resources

Before you start:

1. Record cluster configuration information regarding the number of:
   - Switch networks
   - Switches
   - Switch Port Connection cards per switch
   - Servers
   - SNI cards per server
   - SNI ports per card
2. Record which servers are attached to each switch and the SNI ports used to make each connection
3. Record which HMC controls each hardware group
4. Verify that the connections are OK between the HMC and the frame Bulk Power Assembly (BPA)
5. Check the UPIC power connections between the Bulk Power Distribution (BPD) assembly and the switch DCAs (refer to Table 28 on page 144, Table 29 on page 145, or Table 30 on page 145)
6. Be prepared to record code numbers and use those numbers in the course of analyzing a problem. Go to “Step 1020-1.”

Step 1020-1: Use Table 25 to analyze:
- Diagnostic failures
- Missing resources
- Problems with High Performance Switch Network Manager (HPSNM)

Table 25. Diagnostic fail or missing resources

Step	Symptom	Action
1	The diagnostic program fails to run	Determine if HPSNM is running: • If HPSNM is **not** running, go to Step 2 • If HPSNM is running, check the GUI to see if there are missing resources – If there are missing resources, refresh the GUI and go to Step 3 – If there are **not** any missing resources refresh the GUI and return to “MAP 0100 Start service call” on page 126. If diagnostics still fail, call the next level of support.
2	You cannot open HPSNM	Check the green LED indicator on the switch DCA: • If the LED indicator is lit, check the connections between the HMC and the frame BPCs – If the connections are good refresh the GUI and return to “MAP 0100 Start service call” on page 126 – If the connections are not good, fix the cables and return to “MAP 0100 Start service call” on page 126
3	You can open HPSNM but resources are missing	Check the number of missing resources: • If more than one resource is missing, go to “Step 1020-2” • If there is only one missing resource, go to “Step 1020-3” on page 138

Step 1020-2: HPSNM opens and there are multiple resources missing, use Table 26 on page 138 to analyze problem.

Table 26. Multiple resources missing

<table>
<tr><th>Step</th><th>Symptom</th><th>Action</th></tr>
<tr><td>1</td><td>Switches missing</td><td>Determine which frames have missing switches:
If all missing switches are located in one frame:
Check connectivity and frame bulk power
Go to “Step 1020-4”
If missing switches are located in multiple frames:
Record any error codes or other service numbers reported by the system
Go to “Step 1020-4” and diagnose each frame individually</td></tr>
<tr><td>2</td><td>Switch Port Connection cards (SPC cards) missing</td><td>Determine which switches have missing SPC cards:
If all missing SPC cards are located in one switch:
Check connectivity and switch power
Go to “Step 1020-5” on page 139
If missing SPC cards are located in multiple switches:
Record any error codes or other service numbers reported by the system
Go to “Step 1020-5” on page 139 and diagnose each switch individually</td></tr>
<tr><td>3</td><td>Switch Network Interfaces (SNIs) missing</td><td>Determine which servers have missing SNIs:
If all missing SNIs are located in one server:
Check connectivity and server power
Go to “Step 1020-6” on page 139
If missing SNIs are located in multiple servers:
Record any error codes or other service numbers reported by the system
Go to “Step 1020-6” on page 139 and diagnose each server individually</td></tr>
</table>

Step 1020-3: HPSNM opens and a single resource is missing, use Table 27 to analyze problem.

Table 27. Single resource missing

<table>
<tr><th>Step</th><th>Symptom</th><th>Action</th></tr>
<tr><td>1</td><td>Switch missing</td><td>Check connectivity and frame bulk power for the frame with the missing switch
Go to “Step 1020-4”</td></tr>
<tr><td>2</td><td>Switch Port Connection card (SPC card) missing</td><td>Check connectivity and switch power for the switch with the missing SPC card
Go to “Step 1020-5” on page 139</td></tr>
<tr><td>3</td><td>Switch Network Interface (SNI) missing</td><td>Check connectivity and server power for the server with the missing SNI
Go to “Step 1020-6” on page 139</td></tr>
</table>

Step 1020-4: There is a problem with switch connectivity.

1. Verify correct code version has been loaded on all components (refer to Chapter 2, “Cluster and switch network software,” on page 15)
   - If the correct code version is loaded, go to sub-step 2 on page 139

- If the correct code version is **not** loaded, go to “Firmware installation” on page 104 and then return to “MAP 0100 Start service call” on page 126
2. Check frame power, make certain that:
   - All power cables are connected
   - Power is on at customer supply
   - The frame EPO is turned on
   - If frame power is verified, go to sub-step 3
   - If there is a problem with the frame power, correct the problem and return to “MAP 0100 Start service call” on page 126
3. Check the connections between the HMCs and the frame BPCs
   - If the Ethernet connections are correct:
     a. Disconnect the frame end of the cable
     b. Reconnect the cable
     c. Refresh the GUI
        – If the switch resource is visible on the GUI then the problem is corrected, return to “MAP 0100 Start service call” on page 126
        – If the problem is **not** corrected, contact the next level of support
   - If the Ethernet connections are **not** correct, fix the connections and return to “MAP 0100 Start service call” on page 126

Step 1020-5: There is a problem with a switch port connection (SPC) card.

1. Check frame power, make certain that:
   - All power cables are connected
   - Power is on at customer supply
   - The frame EPO is turned on
   - If frame power is verified, go to sub-step 2
   - If there is a problem with the frame power, correct the problem and return to “MAP 0100 Start service call” on page 126
2. Go to “Faulty port diagnostics” on page 178 in the service procedures to analyze the problem
   - If the problem with the SPC card has been resolved, return to “MAP 0100 Start service call” on page 126
   - If the problem is **not** corrected, contact the next level of support

Step 1020-6: There is a problem with server-SNI connectivity.

1. Verify correct code version has been loaded on all components (refer to Chapter 2, “Cluster and switch network software,” on page 15)
   - If the correct code version is loaded, go to sub-step 2
   - If the correct code version is **not** loaded, go to “Firmware installation” on page 104 and then return to “MAP 0100 Start service call” on page 126
2. Check frame power, make certain that:
   - All power cables are connected
   - Power is on at customer supply
   - The frame EPO is turned on
   - If frame power is verified, go to sub-step 3
   - If there is a problem with the frame power, correct the problem and return to “MAP 0100 Start service call” on page 126
3. Check the connections between the HMCs and the frame BPCs
   - If the Ethernet connections are correct:
     a. Disconnect the frame end of the cable
     b. Reconnect the cable
     c. Refresh the GUI
        – If the SNI resource is visible on the GUI then the problem is corrected, return to “MAP 0100 Start service call” on page 126
        – If the problem is **not** corrected, go to sub-step 4 on page 140

- If the Ethernet connections are **not** correct, fix the connections and return to "MAP 0100 Start service call" on page 126
4. Go to "Faulty port diagnostics" on page 178 in the service procedures to analyze the problem
   - If the problem with the server-SNI connection has been resolved, return to "MAP 0100 Start service call" on page 126
   - If the problem is **not** corrected, contact the next level of support

End of call

End of call procedures (MAP 0650)

Purpose of this MAP

This MAP is referenced upon completion of a service action. This MAP indicates the information to be logged, actions required by the customer to utilize fix, and actions required to verify that the hardware is left in a usable state.

Step 0650-001

If:

- Any of the following FRUs were replaced, complete the associated repair validation (refer to "Repair verification" on page 197). After you have validated all repairs, continue with"Step 0650-003."
  – Switch
  – Switch power supply replaced
  – Switch cooling module replaced
  – Switch port connector card replaced
  – SNI
  – Cable
- You did not replace any FRUs, continue with"Step 0650-002."

Step 0650-002

You **did not** replace and verify a FRU:

1. Was the service action an EC or regular upgrade?
   - If yes:
     a. Record action in account log against all appropriate attached nodes or the EC number
     b. Go to "Step 0650-006" on page 141 for the proper serial number to use when recording the EC
   - If no:
     a. Record action taken in account log
     b. Open a Tracking Problem Management Record (PMR) through support center (RETAIN®)
     c. Record time service action as appropriate service code **Incomplete** against Machine Type/Serial Number
     d. Go to "Step 0650-006" on page 141 for the proper serial number to use when recording the EC

Step 0650-003

You either replaced a FRU or took a service action and verified the fix:

- If you replaced any switch FRU *other than* an SNI, go to "Step 0650-005" on page 141
- If you replaced an SNI, reboot the attached node in NORMAL mode:
  1. To reboot the node, you **must** refer to and follow the procedures in "LPAR reboot using the HMC GUI" on page 159
  2. After the node reboots, check for missing resources
     – Run the command **diag -a**
  3. Verify the replaced FRU is functioning properly by performing ″System Verification Tests″ from the advanced diagnostics menu
  4. Was the System Verification Tests successful?

- If yes, go to “Step 0650-004”
- If no, go to the appropriate service guide for the specific server type and refer to the problem determination MAP

Step 0650-004

You performed the System Verification Test and the ″Resource Repair Action″ menu (801015) displayed. This indicates that the AIX error log contains an entry showing that a monitored FRU has been replaced and that you must reset the error log. To reset the error log:

1. From the Resource Repair Action menu, select the FRU you replaced
2. After you have made all required FRU selections, click **Commit**

   Note: To exit the menu without selecting an item, click **Exit**.
3. When the No Trouble Found menu appears:
   a. Exit the diagnostics
   b. Go to “Step 0650-005”

Step 0650-005

You must now record the service actions and complete a final check.

1. Record the action completed in the account log
2. Properly account for all parts utilized in this service call
3. Record the time as complete on Machine Type/Serial Number
4. Go to “Step 0650-006” for the proper serial number to use when recording the service action

Step 0650-006

Record the failed device serial number on your QSAR

Note: Do not claim service action time against the Model 160 Cluster 1600 serial number. Claim all time against the M/T 7045-SW4 device you actually serviced.

Step 0650-007

In addition to this end of call procedure, you must perform a service inspection on the system if you have:

- Inspected the system for a maintenance agreement
- Performed a requested service on a system that has not recently serviced
- Conducted an alterations and attachments review
- Noticed that changes have been made to the equipment that may affect its safe operation
- Attached power cables for an external devices to that device

Refer to “Service inspection guide” on page 201 for procedure details.

Step 0650-008

Service call is complete.

Chapter 8. Locations

Switch locations

Figure 39 illustrates the front view of the HPS showing fan, DCA, and LED locations.

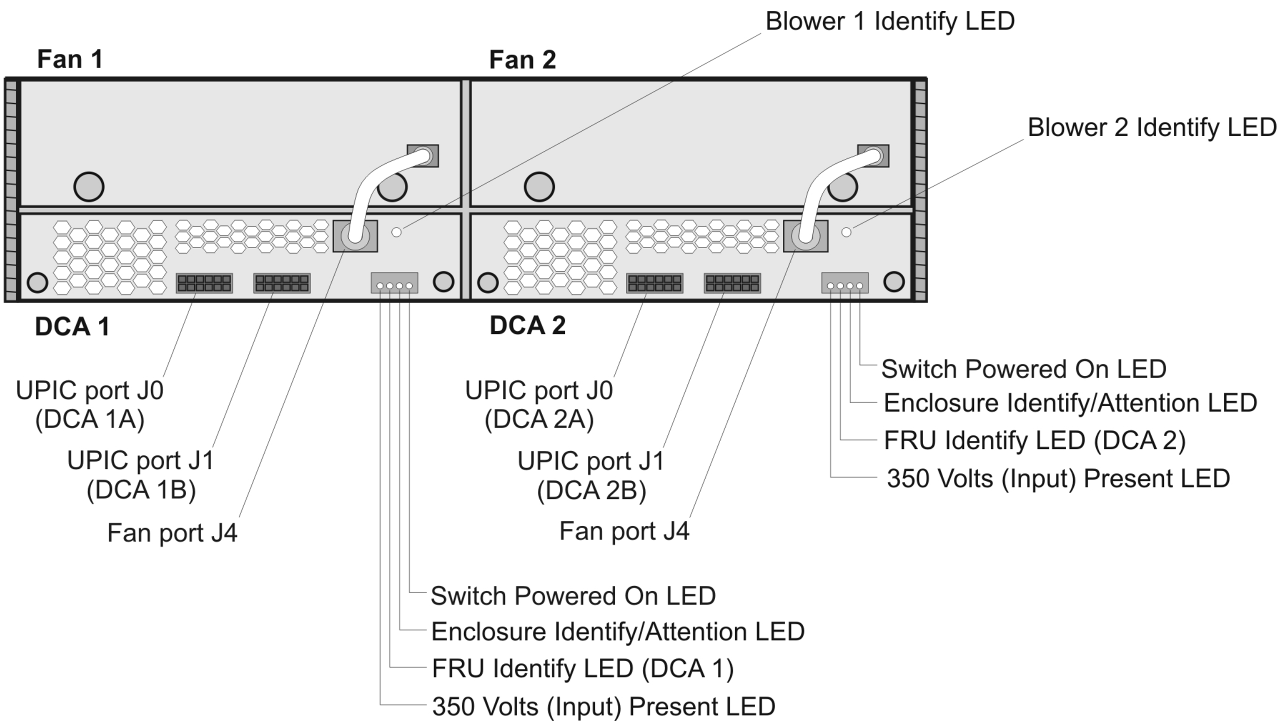


Figure 39. LED, DCA, and fan locations (switch front view)

Figure 40 illustrates the rear view of the HPS showing slot locations for switch port connector cards.

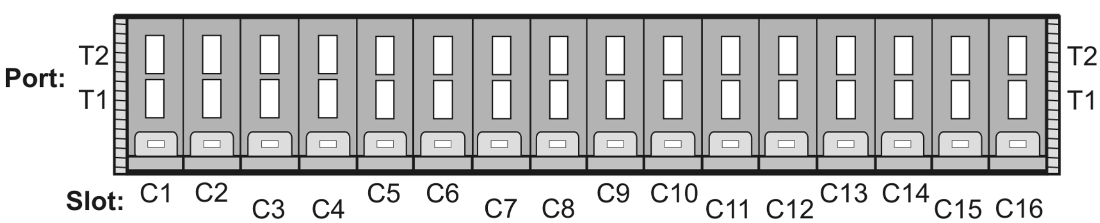


Figure 40. Slot locations for Switch Port Connection cards (switch rear view)

Note: System LEDs provide assistance for locating failing components. Refer to "FRU identification LEDs" on page 170 for additional information.

Bulk Power Enclosure (BPE) locations

Figure 41 on page 144 illustrates connector locations for BPE components of the frame Bulk Power Assembly (BPA).

Note: The Bulk Power Enclosure used in a switch-only frame does not require the Bulk Power Hub (BPH) or the Bulk Power Jumper (BPJ). Switch-only frames configured with the HPS use airflow blanks in those locations.

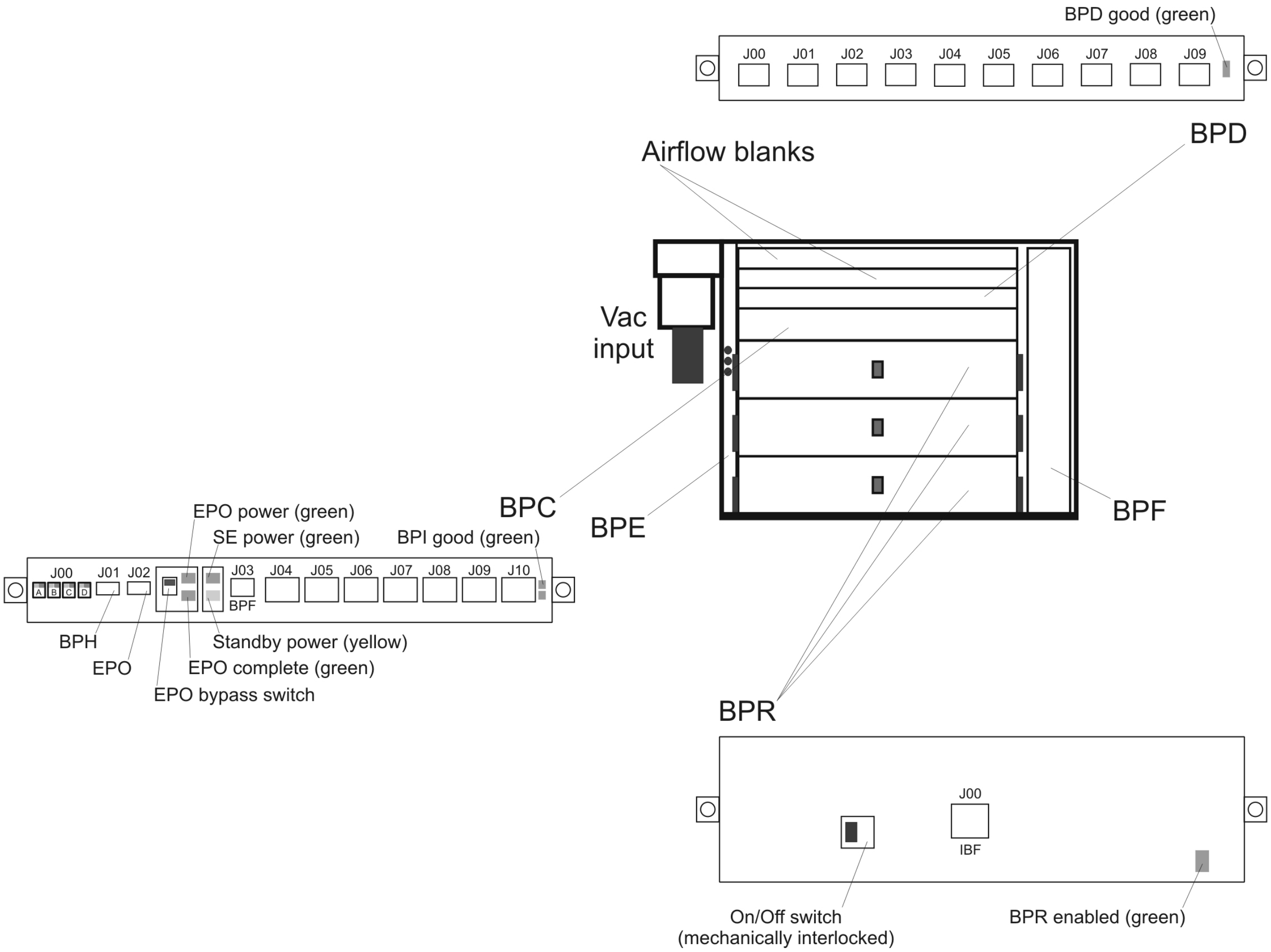


Figure 41. Bulk Power Enclosure (BPE) locations

UPIC plugging locations for the HPS

This section identifies the UPIC plugging locations for the HPS in the following frame configuration:

- “UPIC plugging locations for switches installed in switch-only frames”
- “UPIC plugging locations for switches installed in p5-590 and p5-595 frames” on page 145
- “UPIC plugging locations for switches installed in p5-575 frames” on page 145

UPIC plugging locations for switches installed in switch-only frames

The UPIC plugging locations for switch-only frames are listed in Table 28.

Table 28. UPIC plugging locations for a HPS installed in a switch-only frame

Frame location	DCA-1A	DCA-1B	DCA-2A	DCA-2B
Cage 15 (U1.31)	BPD1 B J03	BPD1 A J03	BPD1 B J02	BPD1 A J02
Cage 13 (U1.27)	BPD1 B J05	BPD1 A J05	BPD1 B J04	BPD1 A J04
Cage 11 (U1.23)	BPD1 B J07	BPD1 A J07	BPD1 B J06	BPD1 A J06
Cage 09 (U1.19)	BPD1 B J09	BPD1 A J09	BPD1 B J08	BPD1 A J08
Cage 07 (U1.13)	BPD1 B J01	BPD1 A J01	BPD1 B J00	BPD1 A J00
Cage 05 (U1.9)	BPC B J09	BPC A J09	BPC B J08	BPC A J08

Table 28. UPIC plugging locations for a HPS installed in a switch-only frame (continued)

Frame location	DCA-1A	DCA-1B	DCA-2A	DCA-2B
Cage 03 (U1.5)	BPC B J07	BPC A J07	BPC B J06	BPC A J06
Cage 01 (U1.1)	BPC B J05	BPC A J05	BPC B J04	BPC A J04

UPIC plugging locations for switches installed in p5-590 and p5-595 frames

Only one HPS may be installed in a p5-590 or p5-595 server frame. In these frames, the switch must be installed in frame slot one. The UPIC plugging locations for this position are listed in Table 29. Refer to the server documentation for other UPIC plugging locations.

Note: In p5-590 and p5-595 server frames, cage identification numbers are assigned according to UPIC plugging order. Because of that, the location of a physical frame slot may not correspond to its assigned cage number. For example, the first frame slot in either a p5-590 or p5-595 server frame is the third location in the UPIC plugging order. Because of that, the first frame slot in these frames is designated as cage 03.

Table 29. UPIC plugging locations for a HPS installed in a p5-590 or p5-595 frame

Frame location	DCA-1A	DCA-1B	DCA-2A	DCA-2B
Cage 03 (U1.1)	BPD1-B J04	BPD1-A J04	BPD1-B J05	BPD1-A J05

UPIC plugging locations for switches installed in p5-575 frames

Two High Performance Switches may be installed in a p5-575 server frame. In these frames, the switches must be installed in either frame slot one or frame slot two. The UPIC plugging locations for these positions are listed in Table 30. Refer to the server documentation for other UPIC plugging locations.

Table 30. UPIC plugging locations for a HPS installed in a p5-575 frame

Frame location	DCA-1A	DCA-1B	DCA-2A	DCA-2B
Cage 02 (U1.5)	BPD1-B J03	BPD1-A J03	BPD1-B J02	BPD1-A J02
Cage 01 (U1.1)	BPC B J05	BPC A J05	BPC B J04	BPC A J04

Location codes

Cluster 1600 systems configured with the HPS and IBM @server p5 servers use location codes that are automatically generated by AIX (includes service processor location codes). These location codes use the form `UMachineType.SerialNumber-ComponentIdentifier`. For additional information on component identifiers, refer to Table 31 on page 146.

Note: If a portion of the location code cannot be resolved, SFP substitutes a # character for unknown elements of the location code. Refer to "Partial location codes" on page 183 for additional details.

In addition to the location codes, the following system resources will help you locate network components:

- The text of the SFP error message provide a description of the frame and cage containing the component
  – You can review this information using the ″Manage Serviceable Events″ option in SFP
- You can toggle system LEDs for assistance with locating failing components
  – Refer to "FRU identification LEDs" on page 170 for additional information
- When you replace a FRU, verify that the serial number listed in the location code matches the actual serial number on the FRU being replaced

Notes:
1. HPSNM uses the logical frame location (UPIC plugging order) for frame slot (cage) references. HPSNM cage locations do not refer to the physical frame slot.
2. If the location code for any FRU other than a switch cable contains the # symbol, that indicates the some of the VPD information for that FRU was not available to the system.

The following tables list the AIX location codes:
- Table 31 for location code prefix identification
- Table 32 for switch location codes
- Table 33 on page 147 for switch port connector location codes
- Table 34 on page 148 for BPA location codes
- Table 35 on page 149 and Table 36 on page 150 for server SNI location codes

Table 31. Location code labels

Prefix	Meaning
A	Air handler (blower, fan)
C	Card (IOP, IOA, Processor Card, Riser Card, Daughter Card, DIMM, SPCN Card, Regulator Card, MCM, L3 Cache, Jumper Card, Passthru Interposer (for Processor Fabric when an MCM is not installed), Pluggable Module Chips, Infiniband Module)
D	Device (Diskette, DASD, Operator Panel, SES Device)
E	Electrical (Battery, Power Supply, Charger)
L	Logical Path SCSI Target, IDE Address, ATAPI Address, Fibre Channel LUN)
P	Planar (Backplane, Board)
T	Port (Port, Connector, Cable Connector, Jack, Interposer)
U	Unit (Card Cage, JBOD, Drawer, Chassis, Unpopulated Drawer)
W	Worldwide unique ID (Fibre Channel)

Table 32. HPS location codes

Switch device	Location code
HPS Drawer/Assembly	U7045.SW4.SerialNumber
Switch Planar	U7045.SW4.SerialNumber-P1
DCA 1	U7045.SW4.SerialNumber-E1
DCA UPIC Cable to BPA-A	U7045.SW4.SerialNumber-E1/Q1
DCA UPIC Cable to BPA-B	U7045.SW4.SerialNumber-E1/Q2
DCA 2	U7045.SW4.SerialNumber-E2
DCA UPIC Cable to BPA-A	U7045.SW4.SerialNumber-E2/Q1
DCA UPIC Cable to BPA-B	U7045.SW4.SerialNumber-E2/Q1
Blower 1	U7045.SW4.SerialNumber-E1-A1
Blower 2	U7045.SW4.SerialNumber-E2-A2
Switch Port Connection cards	Refer to Table 33 on page 147

Table 32. HPS location codes (continued)

Switch device	Location code
Notes: 1. When you replace a FRU, verify that the serial number listed in the location code matches the actual serial number of the FRU. 2. In addition to the location code, the text of the error message in SFP also provides a description of the frame and cage. You can review this information using the ″Manage Serviceable Events″ option in SFP. 3. System LEDs provide assistance for locating failing components. Refer to "FRU identification LEDs" on page 170 for additional information. 4. DCAs and Blowers are numbered left to right as you face the front of the switch assembly.	

Table 33. Switch port connector card location codes

Switch port connector	Location code
Switch port connector card slot 1	U7045.SW4.SerialNumber-P1-C1
Switch port connector card slot 1 bottom port (J3)	U7045.SW4.SerialNumber-P1-C1-T1
Switch port connector card slot 1 top port (J4)	U7045.SW4.SerialNumber-P1-C1-T2
Switch port connector card slot 2	U7045.SW4.SerialNumber-P1-C2
Switch port connector card slot 2 bottom port (J5)	U7045.SW4.SerialNumber-P1-C2-T1
Switch port connector card slot 2 top port (J6)	U7045.SW4.SerialNumber-P1-C2-T2
Switch port connector card slot 3	U7045.SW4.SerialNumber-P1-C3
Switch port connector card slot 3 bottom port (J7)	U7045.SW4.SerialNumber-P1-C3-T1
Switch port connector card slot 3 top port (J8)	U7045.SW4.SerialNumber-P1-C3-T2
Switch port connector card slot 4	U7045.SW4.SerialNumber-P1-C4
Switch port connector card slot 4 bottom port (J9)	U7045.SW4.SerialNumber-P1-C4-T1
Switch port connector card slot 4 top port (J10)	U7045.SW4.SerialNumber-P1-C4-T2
Switch port connector card slot 5	U7045.SW4.SerialNumber-P1-C5
Switch port connector card slot 5 bottom port (J11)	U7045.SW4.SerialNumber-P1-C5-T1
Switch port connector card slot 5 top port (J12)	U7045.SW4.SerialNumber-P1-C5-T2
Switch port connector card slot 6	U7045.SW4.SerialNumber-P1-C6
Switch port connector card slot 6 bottom port (J13)	U7045.SW4.SerialNumber-P1-C6-T1
Switch port connector card slot 6 top port (J14)	U7045.SW4.SerialNumber-P1-C6-T2
Switch port connector card slot 7	U7045.SW4.SerialNumber-P1-C7
Switch port connector card slot 7 bottom port (J15)	U7045.SW4.SerialNumber-P1-C7-T1
Switch port connector card slot 7 top port (J16)	U7045.SW4.SerialNumber-P1-C7-T2
Switch port connector card slot 8	U7045.SW4.SerialNumber-P1-C8
Switch port connector card slot 8 bottom port (J17)	U7045.SW4.SerialNumber-P1-C8-T1
Switch port connector card slot 8 top port (J18)	U7045.SW4.SerialNumber-P1-C8-T2
Switch port connector card slot 9	U7045.SW4.SerialNumber-P1-C9
Switch port connector card slot 9 bottom port (J19)	U7045.SW4.SerialNumber-P1-C9-T1
Switch port connector card slot 9 top port (J20)	U7045.SW4.SerialNumber-P1-C9-T2
Switch port connector card slot 10	U7045.SW4.SerialNumber-P1-C10
Switch port connector card slot 10 bottom port (J21)	U7045.SW4.SerialNumber-P1-C10-T1
Switch port connector card slot 10 top port (J22)	U7045.SW4.SerialNumber-P1-C10-T2

Table 33. Switch port connector card location codes (continued)

Switch port connector	Location code
Switch port connector card slot 11	U7045.SW4.SerialNumber-P1-C11
Switch port connector card slot 11 bottom port (J23)	U7045.SW4.SerialNumber-P1-C11-T1
Switch port connector card slot 11 top port (J24)	U7045.SW4.SerialNumber-P1-C11-T2
Switch port connector card slot 12	U7045.SW4.SerialNumber-P1-C12
Switch port connector card slot 12 bottom port (J25)	U7045.SW4.SerialNumber-P1-C12-T1
Switch port connector card slot 12 top port (J26)	U7045.SW4.SerialNumber-P1-C12-T2
Switch port connector card slot 13	U7045.SW4.SerialNumber-P1-C13
Switch port connector card slot 13 bottom port (J27)	U7045.SW4.SerialNumber-P1-C13-T1
Switch port connector card slot 13 top port (J28)	U7045.SW4.SerialNumber-P1-C13-T2
Switch port connector card slot 14	U7045.SW4.SerialNumber-P1-C14
Switch port connector card slot 14 bottom port (J29)	U7045.SW4.SerialNumber-P1-C14-T1
Switch port connector card slot 14 top port (J30)	U7045.SW4.SerialNumber-P1-C14-T2
Switch port connector card slot 15	U7045.SW4.SerialNumber-P1-C15
Switch port connector card slot 15 bottom port (J31)	U7045.SW4.SerialNumber-P1-C15-T1
Switch port connector card slot 15 top port (J32)	U7045.SW4.SerialNumber-P1-C15-T2
Switch port connector card slot 16	U7045.SW4.SerialNumber-P1-C16
Switch port connector card slot 16 bottom port (J33)	U7045.SW4.SerialNumber-P1-C16-T1
Switch port connector card slot 16 top port (J34)	U7045.SW4.SerialNumber-P1-C16-T2
Note: Switch port connector cards are numbered left to right as you face the back of the switch assembly. System LEDs provide assistance for locating failing components. Refer to "FRU identification LEDs" on page 170 for additional information.	

Table 34. BPA location codes

Power device	Location code
BPA	EIA 35 through 42
BPA cage A (front, includes backplane)	Utttt.mmm.sssssss-P1
BPD 3A	Utttt.mmm.sssssss-P1-C1
BPD 2A	Utttt.mmm.sssssss-P1-C2
BPD 1A	Utttt.mmm.sssssss-P1-C3
BPC A	Utttt.mmm.sssssss-P1-C4
BPR 1A	Utttt.mmm.sssssss-P1-E1
BPR 2A	Utttt.mmm.sssssss-P1-E2
BPR 3A	Utttt.mmm.sssssss-P1-E3
BPF A	Utttt.mmm.sssssss-A1
BPA cage B (back, includes backplane)	Utttt.mmm.sssssss-P2
BPD 3B	Utttt.mmm.sssssss-P2-C1
BPD 2B	Utttt.mmm.sssssss-P2-C2
BPD 1B	Utttt.mmm.sssssss-P2-C3
BPC B	Utttt.mmm.sssssss-P2-C4
BPR 1B	Utttt.mmm.sssssss-P2-E1
BPR 2B	Utttt.mmm.sssssss-P2-E2

Table 34. BPA location codes (continued)

Power device	Location code
BPR 3B	Utttt.mmm.sssssss-P2-E3
BPF B	Utttt.mmm.sssssss-A2

Notes:

1. tttt = machine type
2. mmm = machine model
3. sssssss = machine serial number
4. Refer to server documentation for a complete list of server associated location codes.
5. System LEDs provide assistance for locating failing components. Refer to “FRU identification LEDs” on page 170 for additional information.

Table 35. SNI port location codes for p5-590 and p5-595 servers

Server slot (planar)	Slot location (card)	FRU PLC (physical location code)	Connector PLC (physical location code)
P2	C5	U787C.001.SN-P2-C5	U787C.001.SN-P2-C5-T1
	C6	U787C.001.SN-P2-C6	U787C.001.SN-P2-C6-T1
	C8	U787C.001.SN-P2-C8	U787C.001.SN-P2-C8-T1
	C9	U787C.001.SN-P2-C9	U787C.001.SN-P2-C9-T1
P3	C5	U787C.001.SN-P3-C5	U787C.001.SN-P3-C5-T1
	C6	U787C.001.SN-P3-C6	U787C.001.SN-P3-C6-T1
	C8	U787C.001.SN-P3-C8	U787C.001.SN-P3-C8-T1
	C9	U787C.001.SN-P3-C9	U787C.001.SN-P3-C9-T1
P4	C5	U787C.001.SN-P4-C5	U787C.001.SN-P4-C5-T1
	C6	U787C.001.SN-P4-C6	U787C.001.SN-P4-C6-T1
	C8	U787C.001.SN-P4-C8	U787C.001.SN-P4-C8-T1
	C9	U787C.001.SN-P4-C9	U787C.001.SN-P4-C9-T1
P5	C5	U787C.001.SN-P5-C5	U787C.001.SN-P5-C5-T1
	C6	U787C.001.SN-P5-C6	U787C.001.SN-P5-C6-T1
	C8	U787C.001.SN-P5-C8	U787C.001.SN-P5-C8-T1
	C9	U787C.001.SN-P5-C9	U787C.001.SN-P5-C9-T1

Notes:

1. System LEDs provide assistance for locating failing components. Refer to “FRU identification LEDs” on page 170 for additional information.
2. The SN designator is the device serial number. When you replace a FRU, make certain that the listed serial number matches the actual serial number on the FRU.

Table 36. SNI port location codes for p5-575 servers

Server slot (planar)	Slot location (card)	FRU PLC (physical location code)	Connector PLC (physical location code)
P2	C65	U787D.001.SN-P2-C65	U787D.001.SN-P2-C65-T1
			U787D.001.SN-P2-C65-T2
	C66	U787D.001.SN-P2-C66	U787D.001.SN-P2-C66-T1
			U787D.001.SN-P2-C66-T2

Notes:

1. System LEDs provide assistance for locating failing components. Refer to "FRU identification LEDs" on page 170 for additional information.
2. The SN designator is the device serial number. When you replace a FRU, make certain that the listed serial number matches the actual serial number on the FRU.

Chapter 9. Service procedures

CAUTION:
Servicing of this product or unit is to be performed by trained service personnel only. (C032)

Attention: Some service actions require privileged access to specific HPSNM commands and data on the CSM Management Server. Refer to “Service login ID” on page 56 for information on setting up a user account with secure access.

Attention: Components are susceptible to damage from static discharge. Always use an ESD wristband when working inside frame covers. (See “Personal ESD requirements” for more details.) Do not touch the pins or circuitry on these components.

Personal ESD requirements

The processor uses FRUs that are known to be sensitive to electrostatic discharge (ESD). To prevent ESD damage to FRUs or to prevent system failures, observe the following procedures:

- Keep the FRU in its original static-dissipative shipping container until the FRU is ready to be installed in the system. Move the static-dissipative container near the location where the FRU is to be installed (within ESD wrist strap distance). If the FRU must be put down for any reason, first place it in its static-dissipative container or place it on the static-dissipative mat.
- Open only the covers that are necessary to complete the task. Any time a cover is open the service representative and all people in the area must be ESD-safe. If power is switched on, or if removing or exchanging any FRU, always use the ESD kit (part number 93F2649).
  1. Put on the ESD wrist strap.
  2. Attach the ESD cable to the wrist strap.
  3. Attach the ESD mat to the wrist strap, if required.
  4. Attach the insulated clip to the ESD cable.
  5. Attach the insulated clip to the frame holes labeled **ESD**. If the frame holes are not available, use a grounding point on the frame.

Accessing system information

Information access concepts

Obtaining complete information for a service action may require that you access multiple system consoles. You can simplify this process by using the procedures in this section to remotely access the following system consoles:

High Performance Switch Network Manager (HPSNM) on the CSM Management Server
Console functions include:
- Powering switches on and off
- Network configuration
- Network verification
- Network diagnostic tasks
- For remote access procedures, refer to “Accessing HPSNM from an HMC” on page 153

The ELA Master HMC
Console functions include:
- Queries to Service Focal Point for HPS related serviceable events (excluding internal SNI failures)
- For remote access procedures, refer to “Accessing the HMC GUI from the CSM Management Server” on page 153

HMCs controlling cluster devices
Console functions include:
- Power on and power off tasks
- Activate and deactivate service LEDs
- Direct service functions on FRUs
- SFP queries for serviceable events on controlled devices
- For remote access procedures, refer to “Accessing the HMC GUI from the CSM Management Server” on page 153

The requirement to access multiple consoles results from the methods used to process system information. The HPSNM GUI provides a visual overview of system health. However, error logs and serviceable event information are located on the HMCs. Some of these events are transferred to the ELA Master HMC for Service Focal Point while other events remain on the local HMC controlling the problem device.

To make sure that you have all of the information related to a specific event, you will have to access each of the associated consoles. However, if you configure the Cluster-Ready Hardware Server (CRHS) you will not have to move from HMC to HMC. CRHS simplifies console access by allowing you to open remote HMC sessions from the Management Server using the IBM WebSM GUI. For additional information on this topic, refer to “Cluster-Ready Hardware Server” on page 57.

Accessing HPSNM from an HMC

Note: This is the standard method for accessing the HPSNM GUI for normal cluster operations.

Although the High Performance Switch Network Manager software resides on the CSM Management Server, you are likely to access the GUI from an HMC console. The following procedure allows you to access HPSNM from a remote console:

1. 1. Verify that the System Administrator has provided the required service login ID on the CSM Management Server
   - Refer to “Service login ID” on page 56 for additional details
2. Open the HMC GUI on the local HMC
   - If you are debugging a problem related to the HPS network, you should be working from the HPSNM ELA Master HMC
3. In the **Navigation** area of the HMC GUI, look for the system name used for the CSM Management Server
   - If the Management Server is not listed, you must configure the server:
     a. From the Main Menu, click **Console**
     b. From the drop down menu, select **Add** and then select **Host**
     c. In the dialog box, select the radio button for ″Add the host computer with this name (hostname.subdomain.domain):″
     d. In the text area, enter the name of the CSM Management Server supplied by the System Administrator
     e. Click **Add**
4. Click the name of the Management Server to open the login panel
   - Enter the service login ID and password supplied by the System Administrator
   - The default service ID is hpssvc
   - Click Log On
5. When the CSM GUI opens, look in the **Navigation** area for the CSM cluster
   - Click on **CSM Cluster: `CSM MS NAME`**
6. On the **CSM Cluster** panel, click on the **HPS Network Management** icon
   - If it is properly configured, the service login ID will only allow you to access service commands and data
7. Access functions from the **HPS Network Management** panel as directed in the service procedures
8. When you have completed the service action, use the **Navigation** area to return to the HMC

Accessing the HMC GUI from the CSM Management Server

Note: Although HPSNM resides on the Management Server, the GUI is usually accessed from an HMC. Refer to “Accessing HPSNM from an HMC”for procedural details.

During some service procedures, you may find it advantageous to access the HMC GUIs from the CSM Management Server. The following procedure allows you to remotely access multiple HMC consoles:

1. Before you can remotely login to an HMC, you will need the password for `hscroot`
   - Obtain the password from the System Administrator if needed
2. Open the CSM GUI on the Management Server
3. In the **Navigation** area of the CSM GUI, find the system name for the HMC that you want to access
   - If the HMC is not listed, you will need to configure it:
     a. From the Main Menu, click **Console**
     b. From the drop down menu, select **Add** and then select **Host**
     c. In the dialog box, select the radio button for ″Add the host computer with this name (hostname.subdomain.domain):″
     d. In the text area, enter the name of the HMC supplied by the System Administrator
     e. Click **Add**
4. Click the name of the HMC to open the login panel
5. Enter the *HMC* service login ID and password supplied by the System Administrator
   - The default HMC service ID is *hscroot*
6. Click Log On
7. When the HMC GUI opens, access functions using normal procedures as directed in the service procedures
8. When you have completed the service action, use the **Navigation** area to return to the GUI on the CSM Management Server

Collecting Vital Product Data (VPD)

Attention: Some service actions require privileged access to specific HPSNM commands and data on the CSM Management Server. Refer to “Service login ID” on page 56 for information on setting up a user account with secure access.

VPD collection concepts

Vital Product Data (VPD) allows you to gather and manage system information. This information can help you identify potential problems and provide you with notices about component improvements. In a standard configuration, the VPD for IBM @server p5 servers is available from the HMC. However, when the High Performance Switch is configured into the server cluster, Vital Product Data resides in two locations:

1. HPSNM performs VPD collection for switches and switch-only frames
   - This information is available from the HPSNM ELA Master HMC and the CSM Management Server
2. The administrative network performs VPD collection for the server mounted SNIs
   - This information is available from the HMC controlling the server

Because HPS VPD resides in two locations, collecting this information may require separate procedures. With internet access to the HMCs, VPD collection can be automated through Service Agent and special procedures are not required. However, if security requirements limit internet access and automated VPD collection is not possible, there are several manual methods to collect VPD data for analysis. The following sections describe each method.

VPD collection methods

There are three general VPD collection methods and several specific collection methods for individual devices. The general collection methods are:

- “Automated VPD collection and forwarding” on page 155
- “Manual VPD collection from the ELA Master HMC” on page 155
- “Manual VPD collection from the CSM Management Server” on page 156

Automated VPD collection and forwarding

This method can collect VPD for each server and all HPS network components in the cluster. Full automation requires configuring Service Agent on each HMC to automatically collect VPD on a scheduled basis. By configuring **all** HMCs to automatically collect Vital Product Data, Service Agent will also return VPD collected by HPSNM from the current ELA Master HMC. With Internet access, Service Agent will also automatically forward the VPD to IBM. For additional information, refer to your HMC documentation under the heading, ″Configuring Electronic Service Agent on your HMC.″

Note: If you are only collecting VPD gathered by HPSNM, you must remember that the HMC designated as the ELA Master may change over time. To make sure that you are receiving valid VPD from HPSNM, you must designate a specific set of HMCs that will act as the ELA Master or ELA Backup HMC.

Configuring the HMC for automated VPD collection and forwarding:

Attention: For automated VPD collection, you must configure **all** cluster HMCs using this procedure.

If Service Agent is configured with a direct connection to IBM, the system can gather and send VPD from the HMC to IBM using a modem or internet connection.

1. Open the **Navigation** panel on the HMC GUI
2. Open the **Service Applications** folder and select **Service Agent**
3. From the **Service Agent** panel select **Register and Customize Service Agent task**
   - This opens a separate window titled **Electronic Service Agent**
4. From the **Electronic Service Agent** window, expand the **Manual Tools** folder
5. Select **VPD** item
6. From the **VPD** panel, under **Machines**, click on the HMC hostname
7. Click the **Collect VPD** button
8. Click the **Send VPD** to IBM button

Manual VPD collection from the ELA Master HMC

Attention: If you are manually collecting VPD from the HMC, you **must** gather that information from the ELA Master HMC. There are two options for determining the current ELA Master HMC:

- From the CSM Management Server, open the ″HPS Network Management″ panel on HPSNM and click ″HPSNM ELA Master HMC
- From the CSM Management Server, enter the command `/opt/csm/hpsnm/bin/chelamast -q`

You can manually collect VPD for all cluster components using Service Agent on the ELA Master HMC. If the ELA Master HMC has Internet access, you can also use Service Agent to forward the information to IBM. If the HMC does not have Internet access, you will have to write the VPD to file and transfer the information using a different system.

Note: If you do not need VPD for the entire cluster, refer to “Manual VPD collection from the CSM Management Server” on page 156. That section has procedures for collecting VPD subsets.

To collect VPD for the entire cluster:

1. Open the **Navigation** panel on the ELA Master HMC GUI
2. Open the **Service Applications** folder and select **Service Focal Point**
3. From the **Service Focal Point** panel, select **Collect VPD Information**
4. From the **Inventory Scout Data Collection** panel, select the system by machine type, model, and serial number
5. Click the **Next** button

6. If the ELA Master HMC:
   - Has Internet access, click the **Send VPD** button
   - Does not have Internet access:
     a. Insert a blank, formatted diskette into the HMC diskette drive
     b. Follow instructions on the **Inventory Scout** panel to write VPD to diskette
     c. Take the diskette to another system with internet access
     d. Bring up an internet browser and enter the following URL: http://techsupport.services.ibm.com/server/aix.invscoutVPD
     e. Select the link to **Upload a data file** and follow the instructions
     f. Use browse button to select the diskette drive and filenames containing the VPD

Note: For additional information, refer to your HMC documentation under the heading, ″Configuring Electronic Service Agent on your HMC.″

Manual VPD collection from the CSM Management Server

When Internet access is not available, manual VPD collection from the CSM Management Server allows you to gather switch related information and write it to a file. Manual VPD collection uses several variations of the `vpdfs` command. These command variations allow you to retrieve specific sets of VPD information including:
- "Manual VPD collection for the entire switch network"
- "Manual VPD collection for a single switch network"
- "Manual VPD collection for individual switches"
- "Manual VPD collection for SNIs" on page 157
- "Manual VPD collection for BPAs" on page 157

Note: Refer to "The vpdfs command" on page 158 for additional details.

Manual VPD collection for the entire switch network: To manually collect VPD for all High Performance Switches and switch-only frames in the cluster, perform the following procedure from the CSM Management Server:

1. Have the system administrator create a directory on the CSM Management Server for the VPD file
2. Log onto the CSM Management Server and `cd` into the new directory
3. In that directory, issue the command `/opt/csm/hpsnm/bin/vpdfs –x cluster`
4. That command collects the VPD information for the entire cluster and writes it to a file called `7045-SW4-bycluster.xml`

   Note: The system creates this file in the directory where you issued the command.

Manual VPD collection for a single switch network: To manually collect VPD for the High Performance Switches and switch-only frames on a single network, perform the following procedure from the CSM Management Server:

1. Have the system administrator create a directory on the CSM Management Server for the VPD file
2. Log onto the CSM Management Server and `cd` into the new directory
3. In that directory, issue the command `/opt/csm/hpsnm/bin/vpdfs –x network –n [network number]`
4. That command collects the VPD information for the entire cluster and writes it to a file called `7045-SW4-bynetwork([network number]).xml`
   - For example, the network parameter `-n 1` produces an output file called `7045-SW4-bynetwork(1).xml`

Notes:
1. The system creates the VPD collection file in the directory where you issued the command.
2. Product Engineering may ask you to rename the VPD file to help them organize the data for analysis.

Manual VPD collection for individual switches: Manual VPD collection for a specific High Performance Switch requires several commands on the CSM Management Server:

1. Have the system administrator create a directory on the CSM Management Server for the VPD file
2. Contact Product Engineering to obtain a filename for the VPD file
   - A typical filename for this type of VPD file would be `switchvpd_frameX_cageX`
   - Verify with the customer that the filename is safe to use
3. Log onto the CSM Management Server and `cd` into the new directory
4. Collect VPD for the switch planar:
   - From the collection directory, issue the command: `/opt/csm/hpsnm/bin/vpdfs –y switch –r planar –f [frame] –c [cage] >> [vpdfile name]`

   Note: For this usage `-c [cage]` requires the logical cage number (based on UPIC plugging order). Do not use the frame slot location number.
5. Collect VPD for the Switch Port Connection (SPC) cards
   - From the collection directory, issue the command: `for i in 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15; do /opt/csm/hpsnm/bin/vpdfs –y switch –r riser –f [frame] –c [cage] –h $i >> [vpdfile name]; done`

   Note: Each switch may have up to 16 SPC cards. The command used in this step will step through each location and gather the VPD for each occupied slot.
6. Collect VPD for the DCAs
   a. From the collection directory, issue the command: `/opt/csm/hpsnm/bin/vpdfs –y switch –r riser –f [frame] –c [cage] –h 1 >> [vpdfile name]`
      - Collects VPD for DCA 1

   b. From the collection directory, issue the command: `/opt/csm/hpsnm/bin/vpdfs –y switch –r riser –f [frame] –c [cage] –h 2 >> [vpdfile name]`
      - Collects VPD for DCA 2

Manual VPD collection for SNIs: To manually collect VPD for the Switch Network Interfaces (SNIs) perform the following procedure from the CSM Management Server:

1. Have the system administrator create a directory on the CSM Management Server for the VPD file
2. Contact Product Engineering to obtain a filename for the VPD file
   - A typical filename for this type of VPD file would be `snivpd_frameX_cageX_chipX`
   - If you are collecting VPD for all of the SNIs in a server, you can drop `_chipX` from the name
   - Verify with the customer that the filename is safe to use
3. Log onto the CSM Management Server and `cd` into the new directory
4. Collect VPD for the SNIs:
   - To collect VPD for specific SNIs, use the command: `/opt/csm/hpsnm/bin/vpdfs –y cec -r sma -f [frame] -c [cage] -h $i>> [vpdfile name]`
   - To collect VPD for all SNIs in a server, use the command: `for i in 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15; do  /opt/csm/hpsnm/bin/vpdfs –y cec -r sma -f [frame] -c [cage] -h $i>> [vpdfile name]; done`

   Note: If you know the SNI numbers in the server, you can use those specific numbers in the command. To find the SNI numbers for a server, open the HPSNM GUI Endpoint View. Highlighting the server identifies the SNIs. Use the adapter number listed for the SNI in the command.

Manual VPD collection for BPAs: To manually collect VPD for the BPAs perform the following procedure from the CSM Management Server:

1. Have the system administrator create a directory on the CSM Management Server for the VPD file
2. Contact Product Engineering to obtain a filename for the VPD file
   - A typical filename for this type of VPD file would be `bpavpd_frameX_sideX`
   - If you are collecting VPD for the BPAs on both sides of the frame, you can drop `_sideX` from the name

- Verify with the customer that the filename is safe to use
3. Log onto the CSM Management Server and `cd` into the new directory
4. Collect VPD for the BPAs
   - To collect VPD for side 1, use the command: `vpdfs -y bpa -a 1 -f 5 -c 255 -r bpa >> [vpd_filename]`
   - To collect VPD for side 2, use the command: `vpdfs -y bpa -a 2 -f 5 -c 255 -r bpa >> [vpd_filename]`
   - To collect VPD for both side 1 and side 2, use the command: `vpdfs -y bpa -f 5 -c 255 -r bpa >> [vpd_filename]`

The vpdfs command: Using variations of the `vpdfs` command, you can manually collect Vital Product Data. This command **must** be issued from the **Management Server**.

vpdfs This command allows the user to manually collect VPD for Inventory Scout and error log analysis tasks.
- Required flags:
  - **-x** identifies cluster and network (not used if `-y` flag is used)
    - Use `-x cluster` if `-n` flag is not used
    - Use `-x network` if `-n` flag **is** used
  - **-y** identifies cage type using the following options:
    - `-y switch`
    - `-y cec`
    - `-y bpa`
  - **-r** identifies primary FRUs according to cage type (`-y` flag) using the following options:
    - For `-y switch`:
      - `-r dca`
      - `-r planar`
      - `-r riser`
    - For `-y cec`:
      - `-r adapter`
    - For `-y bpa`:
      - `-r bpc`
      - `-r bpd`
      - `-r bpr`
      - `-r ibf`
      - `-r epo_sw`
  - **-f** identifies frame
  - **-c** identifies cage
    - Identified by UPIC plugging order, not frame slot

  Note: If you are using the `-x` flag, do not use the following flags: `-y`, `-f`, `-c`, `-r`.
- Optional flags:
  - **-t** places time stamp on output
  - **-h** identifies the specific component number at the device location indicated by the required flags
  - **-p** identifies port for device location indicated by the required flags
  - **-a** identifies BPA number (VPD for both BPAs collected if you omit `-a` flag)
  - **-n** identifies network (optional for both `-x` and `-y` flags)
  - **-m** identifies MTMS for the device

Setting up the IBM WebSM GUI

The standard HMC installation procedure automatically configures the IBM WebSM GUI. However, the System Administrator must configure the IBM WebSM GUI on the CSM Management Server. The CSM documents include procedures for setting up the GUI on the Management Server.

Authentication with CSM

Attention: Some service actions require privileged access to specific HPSNM commands and data on the CSM Management Server. Refer to “Service login ID” on page 56 for information on setting up a user account with secure access.

The minimum requirement for authentication and system access using CSM is that you have access to HPSNM commands and data on the Management Server. Depending on system security policy, you may or may not be allowed personal access to the required commands and data. If system policy allows personal access, the recommended method is for the System Administrator to create a service ID (refer to the guidelines listed in the CSM documentation). However, you must consult with the System Administrator to find out how the service ID was implemented. If the System Administrator placed an expiration time on the service ID, you must make certain that enough time has been allocated for the service procedure.

If security policies do not allow the System Administrator to create a service ID, someone with root access will have to work with you. Using root level authentication, that person will have to access the HPSNM GUI and commands as required for service actions.

Managed system power on and power off (LPAR reboot)

Attention: Some service actions require privileged access to specific HPSNM commands and data on the CSM Management Server. Refer to “Service login ID” on page 56 for information on setting up a user account with secure access.

Managed systems are the systems that are physically attached to and managed by the HMC. The HMC can perform tasks that affect the entire managed system, such as powering the system on and off. You can also create partitions and profiles within each managed system. These partitions and profiles define the way that you configure and operate your partitioned system. For additional information on partitions and managed systems, refer to *IBM Hardware Management Console for pSeries Installation and Operations Guide*.

LPARs are one type of managed system. Some procedures require that you power off, power on, or reboot one or more LPARs. If your system is configured with the HPS, you must use one of the following procedures. Failure to do so will create false errors in Service Focal Point and may add to the time required for service actions. The options to cycle LPAR power are:

- “LPAR reboot using the HMC GUI”
- “LPAR reboot using the server command line” on page 161

Server power procedures

If a service procedure requires that you power on or power off a server, you must follow the procedures defined for that server type. You can find the procedure for each server type in the service guide for that server.

LPAR reboot using the HMC GUI

The HMC GUI has two functions for cycling power:

- “Managed system power on” on page 160
- “Managed system power off” on page 160

Note: If you use the ″reset″ option on the HMC GUI to cycle multiple LPARs, some switch links will not shutdown properly. As a result, HPSNM may hang and Service Focal Point will report false errors.

To cycle multiple LPARs, you must use the ″shutdown″ option. Do not the ″reset″ option. You should only use the ″reset″ option on the HMC GUI if an LPAR does not respond to the ″shutdown″ option.

Managed system power on

You can use the HMC GUI to power on the managed system. To power on the managed system, you must be either:
- A system administrator
- An advanced operator
- An operator
- A service representative

Use the following procedure to power on the managed system:
1. From the HMC GUI Navigation area, open the ″Server and Partition″ folder
2. Click the ″Server Management″ icon
3. In the Contents area, select the managed system you wish to power on
4. From the menu, click ″Selected″ → ″Power On″ and then select one of the following power-on modes:

   Partition Standby
   Allows you to create and activate logical partitions.

   Full System Partition
   Allows you to use all system resources on one operating system. This power option is the traditional single-system method of using system resources and offers the following options:
   - Power On Normal
   - Power On Diagnostic Default Boot List
   - Power On Diagnostic Stored Boot List
   - Power On SMS
   - Power On Open Firmware OK Prompt

   System Profile
   Powers on the system according to a predefined set of profiles.

   Power On Autostart
   Powers on the managed system to partition standby mode and then activates all partitions that had been previously powered on. Using this power on mode, the HMC ignores defined partition profiles. Instead of using the defined profile, the HMC activates each partition using the configuration in effect when the partition was powered off.

For additional information on these power modes, refer to *IBM Hardware Management Console for pSeries Installation and Operations Guide*.

Note: You must power off your managed system to switch between using the Full System Partition and using either logical or affinity partitions. You must also power off the system between activating logical partitions and affinity partitions.

Managed system power off

You can use the HMC to power off the managed system. To power off the managed system, you must be either:
- A system administrator
- An advanced operator
- An operator
- A service representative

Note: Before you power off the managed system, make certain that **all** partitions have been shut down and their states have changed from *Running* to *Ready*.

Use the following procedure to **shut down** a partition and set it to *Ready*:

1. In the HMC GUI Navigation area, click the ″Server and Partition″ folder
2. In the Contents area, click the ″Server Management″ icon
3. In the Contents area, click the icon for the managed system to expand the system tree
4. Select the partition that you want to shut down
5. Select ″Operating System″ → ″Shut down″

After all partitions have been set to *Ready*, you can power off the system. To **power off** the managed system, do the following:

1. In the Contents area, select the managed system
2. From the menu, click ″Selected″ → ″Power Off″

When you power off the managed system, each partition associated with that managed system also powers off.

LPAR reboot using the server command line

As an alternate to using the HMC GUI, you can also reboot LPARs from the command line on either a system server or the Management Server. To make certain that all switch links are properly shutdown and re-enabled, you must use the `shutdown` command to recycle the LPARs in your cluster. If you use the `reboot` or `rpower` command to cycle multiple LPARs, some switch links will not shutdown properly. As a result, HPSNM may hang and Service Focal Point will report false errors.

Notes:

1. To use these commands, you **must** have root user authority on the affected servers and you must run these commands from the root directory on the affected servers.
2. You should only use the `rpower` command from a server only if an LPAR does not respond to the `shutdown` command.
3. Before using them, make certain that you fully understand these commands. Refer to your operating system and cluster management documents for additional information.

If you are using the command line, you must use the `shutdown` command when:

You are going to power off CEC

Before you power off the CEC, you must run the `shutdown -F` command on all LPARs before the CEC is powered off

- The `shutdown -F` command must be run from the command line on the server CEC you need to power off
- The `shutdown -F` command will only affect LPARs associated with the server where you ran the command
- The -F flag halts warning messages to other users and causes a fast shutdown

Note: The `shutdown -F` command forces **all** user sessions and **all** user jobs on the LPARs associated with that server to terminate. Please refer to your AIX command guide for additional information on the `shutdown` command.

You have installed software on an LPAR and the installation requires that you reboot that LPAR

To shutdown and then reboot the server associated with the LPAR, open a command line on that server and run the `shutdown -Fr` command

- The `shutdown -Fr` command must be run from the command line on the server CEC you need to power off
- The `shutdown -Fr` command will only affect LPARs associated with the server where you ran the command
- The -F flag halts warning messages to other users and causes a fast shutdown
- The -r flag initiates the reboot command

Note: The `shutdown -Fr` command forces **all** user sessions and **all** user jobs on the LPARs associated with that server to terminate. Please refer to your AIX command guide for additional information on the `shutdown` command.

You have installed software on an entire cluster and the installation requires that you reboot all LPARs in that cluster

To shutdown and then reboot the entire cluster, open a command line on the Management Server and run the `dsh -av "shutdown -Fr"` command (quotation marks required). In this command:

- The -a flag causes dsh to issue the `"shutdown -Fr"` command to all nodes defined in the WCOLL environment variable
- The -v flag limits dsh so that the `"shutdown -Fr"` command is only issued to responding nodes

Note: The `dsh -av "shutdown -Fr"` command forces **all** user sessions and **all** user jobs on the cluster to terminate. Please refer to your operating system and cluster management documents for additional information on these commands.

Network verification for topology changes

Attention: If you are doing the initial network installation or adding a new switch to an existing network, **do not** use this procedure. You must verify the initial network installation using the procedures described in “Bringing the network online and reporting Installation Complete” on page 109.

If you change the configuration of a switch network by adding, deleting, or replacing switches on an *operational* network, then you **must** verify the network. The verification procedure is divided into two parts:

- “Optional network reset for topology changes”
- “Required verification for topology changes” on page 164

Note: By performing the optional network reset **before** the required verification, you place the network into a known state. Starting verification from a known state reduces the possibility of false returns from network components that are not in the optimal test state.

Optional network reset for topology changes

Attention: Although this is an optional procedure, if you do not take this action the subsequent network verification may produce false errors.

1) Verify that HPSNM is operating in ″Normal Mode″

To set normal operating mode:

1. On the Management Server, open the CSM GUI
2. From the Navigation area of the GUI, open the ″Switch Management″ panel
3. Select ″Switch Network Management″
4. On the HPSNM Network Management panel, click ″Enable HPSNM Software for Normal Operation″

   Note: Make certain that you select the option for Normal Operation and not the option to ″Enable HPSNM Software for Switch Network Verification.″

2) Power off switches in server frames using HPSNM

Using either the HPSNM or `chswpower` command from the HPSNM command line, power off all switches located in server frames. From the GUI:

1. Open the ″Switch Topology View″ panel
2. Select the network containing the switches you want to power off
3. Select the switches to power off
4. From the main menu, click ″Selected″
5. From the drop down menu, select ″Power Off″

6. Confirm the action by clicking the appropriate button

3) Disable HPSNM

1. On the Management Server, open the CSM GUI
2. From the Navigation area of the GUI, open the ″Switch Management″ panel
3. Select ″Switch Network Management″
4. On the HPSNM network management panel, click ″Disable HPSNM software″

4) Power off all servers

Refer to "Managed system power off" on page 160 for this procedure

5) UEPO off all switch-only frames

Place the UEPO switch on each **switch-only** frame in the off position

6) UEPO on all switch-only frames

Place the UEPO switch on each **switch-only** frame in the on position

7) Enable HPSNM for normal operation

To set normal operating mode, verify that HPSNM is currently disabled, then:

1. On the Management Server, open the CSM GUI
2. From the Navigation area of the GUI, open the ″Switch Management″ panel
3. Select ″Switch Network Management″
4. On the HPSNM Network Management panel, click ″Enable HPSNM Software for Normal Operation″

   Note: Make certain that you select the option for Normal Operation and not the option to ″Enable HPSNM Software for Switch Network Verification.″

8) Power on switches in server frames using HPSNM

Using either the HPSNM or `chswpower` command from the HPSNM command line, power on all switches located in server frames.

Note: At this point the servers remain powered off. Power on switches only.
From the GUI:

1. Open the ″Switch Topology View″ panel
2. Select the network containing the switches you want to power on
3. Select the switches to power on
4. From the main menu, click ″Selected″
5. From the drop down menu, select ″Power On″
6. Confirm the action by clicking the appropriate button

9) Disable HPSNM

1. On the Management Server, open the CSM GUI
2. From the Navigation area of the GUI, open the ″Switch Management″ panel
3. Select ″Switch Network Management″
4. On the HPSNM network management panel, click ″Disable HPSNM software″

10) Verify the cluster service network

Verify that the system recognizes each component by making sure that all frames and servers appear on the HPSNM GUI

1. From the Navigation area of the GUI, open the ″Switch Management″ panel
2. Select ″Switch Network Management″
3. On the ″Switch Network Management″ panel, click ″Display Cluster Components″
   - Depending on the size of your network, it may take several minutes for the system to display all network components
   - If the network components are not listed in five minutes, refresh the display
   - If needed, wait an additional five minutes are refresh the display a second time

4. When fully resolved, the ″Display Cluster Components″ selection shows an ID list and item count for switches and servers
   - If the system is unable to resolve the network components, look for problems in the Ethernet components of the cluster service network

     Note: SNIs are not listed in the ″Display Cluster Components″ panel.

Required verification for topology changes

Attention: If you did not perform the "Optional network reset for topology changes" on page 162, the verification procedures in this section may indicate problems that do not exist.

1) Disable HPSNM

Note: If HPSNM is already disabled, continue with the next step.

If the HPSNM is not already disabled from the "Optional network reset for topology changes" on page 162, then follow this procedure:

1. On the Management Server, open the CSM GUI
2. From the Navigation area of the GUI, open the ″Switch Management″ panel
3. Select ″Switch Network Management″
4. On the HPSNM network management panel, click ″Disable HPSNM software″

2) Select the new logical topology

Open the HPSNM Network Management panel and define the switch network topology:

1. Click on ″Select Logical Topology″
2. When the dialog box opens, select the number of networks and the topology option having the best match to your system:
   - Select 1 or 2 as the number of networks
   - The topology selection provides you with choices for all supported network configurations
     – For example: with either one or two networks, 2NSB_0ISB_32EP would be the selection for a two NSB network without ISBs and having a maximum of 32 endpoints
     – Refer to Appendix C, "HPS network configuration," on page 305 and Appendix D, "Cabling the HPS," on page 337 for detailed information on supported network configurations

   Note: The topology options listed in this dialog box are defined with the maximum number of endpoints for each network configuration. However, your network may not utilize the maximum number of endpoints. Therefore, your topology selection only needs to match the number of NSBs and ISBs presented in the list of options.

3) Power off servers

Note: If the servers are already powered off from the optional reset, continue with the next step.

If the servers are not powered off, refer to "Managed system power off" on page 160 for this procedure

4) Enable HPSNM for switch verification

1. On the Management Server, open the CSM GUI
2. From the Navigation area of the GUI, open the ″Switch Management″ panel
3. Select ″Switch Network Management″
4. On the HPSNM Network Management panel, click ″Enable HPSNM Software for Switch Network Verification″

   Note: Make certain that you select the option for Switch Network Verification and not the option to Enable HPSNM Software for Normal Operation.

5) Check the network topology

Open the ″Switch Topology View″ panel on HPSNM and verify that the ″Discovered Topology″ is the same as the ″Selected Topology.″

Note: It may take up to ten minutes for the system to fully display the topology.

- If the selected and discovered topologies match, continue with Step 6
- If the selected and discovered topologies *do not* match, look for one of the following causes in the order listed:

  A) ″Selected Topology″ incorrectly specified in Step 2

  – If you are certain that you selected the correct topology, look at the next possible cause

  – If you *are not* certain that you selected the correct topology in Step 2:
    1. Disable HPSNM
    2. Select the logical topology
    3. Enable HPSNM for switch verification
    4. Open the ″Switch Topology View″ panel and verify that the ″Discovered Topology″ is the same as the ″Selected Topology″

  B) Network incorrectly cabled

  Verify that the network was correctly cabled by comparing the network planning sheets to the physical network cabling.

  – If you are certain that you correctly cabled the network, look at the next possible cause

  – If *are not* certain that you cabled the network correctly:
    1. Disable HPSNM
    2. Make all needed cable corrections
    3. Enable HPSNM for switch verification
    4. Open the ″Switch Topology View″ panel and verify that the ″Discovered Topology″ is the same as the ″Selected Topology″

  C) Error in the cable planning data

  If *all* of the following conditions are true, there may be a problem with the cable planning data:

  – The ″Selected Topology″ appears correct in the ″Switch Topology View″

  – The actual network cabling matches the cable planning data

  – The ″Selected Topology″ does not match the ″Discovered Topology″

  Note: If there is an error in the cable planning data, that information will have to be recalculated.

6) Power on servers

Refer to “Managed system power on” on page 160 for this procedure

7) Run the host-based verification tools

Refer to “Task 3: Run the host-based verification tools” on page 122 for these procedures.

8) Verify switch chip ports and SNI chip ports

- Verify switch chip ports

1. From HPSNM, check the status of switch chip ports 4, 5, 6, and 7:
   a. Open the ″Switch Topology View″ panel
   b. From the main menu, click ″File″ and select ″Expand All″
   c. From the main menu, click ″Filter″
      1) From the drop down menu, select ″Edit Filter″
      2) Select ″Port Status″
      3) If this is:

– The first time through this procedure, select ″Not Operational″ as the filtering criteria
– The second time through this procedure, select ″Svc Required″ as the filtering criteria

Note: With these filters, the system check will only display network components with problems. If a component is OK, it will not display on the GUI screen. However, if your network has unused links, the Switch Topology View sees this as a faulty connection and displays a status of Not Operational for that location.

d. The refreshed display shows all switch planar ports across the entire network that have a status of:
   – ″Not Operational″ for the first time through this procedure
   – ″Svc Required″ for the second time through this procedure

   Note: If the display **does not** show ″Not Operational″ or ″Svc Required″ for switch chip ports 4, 5, 6, or 7, this indicates that all switch chip ports 4, 5, 6, or 7 across the network are OK and you can go to step 2.

e. If the display shows a status of ″Not Operational″ or ″Svc Required″ for switch chip ports 4, 5, 6, or 7:
   1) The problem is on a switch planar, ignore any errors reported on switch chip ports 0, 1, 2, or 3
   2) Determine which planar is reporting the fault
   3) Replace the planar
   4) Refresh the GUI display
   5) When the display does not show a status of ″Not Operational″ or ″Svc Required″ for switch chip ports 4, 5, 6, or 7, go to step 2 and check the status of switch chip ports 0, 1, 2, and 3

2. Check the status of switch chip ports 0, 1, 2, and 3:
   a. Refresh the GUI display for Switch Topology View
   b. If the Switch Topology View:
      – **Does not** show any switch chip ports reporting a status of ″Not Operational″ or ″Svc Required,″ continue with step 3
      – Shows ″Not Operational″ or ″Svc Required″ as a status for switch chip ports 0, 1, 2, or 3 this indicates three possible conditions that may be causing the fault:
        1) **Empty**: There is a Switch Port Connection card slot on the switch that is either filled with a blank connection card or it is empty. You will need to review the switch cable planning data and determine whether or not that slot was supposed to have a functioning Switch Port Connection card installed.
           - If the slot is blank and this matches the planning data, ignore this error and continue.
           - If the planning data shows that the slot should not be blank, re-cable the connection card as required. After this service action, refresh the GUI, verify the fix, and continue.
        2) **Miswire**: Review the switch cable planning data for that Switch Port Connection card
           - If the cable connections on the Switch Port Connection card do not match the planning data, re-cable the ports as needed. After this service action, refresh the GUI, verify the fix, and continue.
           - If the cable connections match the planning data, then there was a mistake in the planning data that will need to be corrected.
        3) **Faulty**: Review the switch cable planning data. If the connection card is cabled correctly, run diagnostics (refer to “Switch diagnostics” on page 177) and replace FRUs as specified. After this service action, refresh the GUI, verify the fix, and continue.

Note: If you have a physical location code for the faulty port, you can ignore the first two steps of the switch diagnostic procedure and start with step 3 of that procedure.

3. If the Switch Topology View display does not show any *unexpected* errors (refer to "Unexpected errors" on page 180), continue with the procedure for verifying the SNI chip ports.

   Note: Blank Switch Port Connection cards that are in the proper location will display bad status in the Switch Topology View. However, these errors are expected and can be ignored.

- Verify SNI chip ports
  1. Open the ″End-Point View″ panel
  2. From the main menu, click ″File″
     – From the drop down menu, select ″Expand All″
  3. From the main menu, click ″Filter″
     a. From the drop down menu, select ″Edit Filter″
     b. Select ″Port Status″
     c. If this is:
        – The first time through this procedure, select ″Not Operational″ as the filtering criteria
        – The second time through this procedure, select ″Svc Required″ as the filtering criteria
  4. Check the status of chip port 1 on all SNIs:
     – If the status of any SNI chip port 1 is reported as ″Not Operational″ or ″Svc Required,″ replace the associated SNI. After this service action, refresh the GUI, verify the fix, and continue.
     – If the display **does not** show a status of ″Not Operational″ or ″Svc Required″ for any SNI chip port 1, continue with step 5.
  5. Check the status of chip port 0 on all SNIs:
     – If the display **does not** show status of ″Not Operational″ or ″Svc Required″ for any SNI chip port 0, continue with step 9 and disable HPSNM
     – If the status of any SNI chip port 0 is reported as ″Not Operational″ or ″Svc Required,″ continue with step 6.
  6. If the display shows a status of ″Not Operational″ or ″Svc Required″ for SNI chip port 0, this indicates three possible conditions:
     a. **Empty**: There is an SNI slot that is empty or not cabled. You will need to review the switch cable planning data and determine whether or not that slot was supposed to have an SNI installed.
        – If the slot is empty and this matches the planning data, ignore this error and continue.
        – If the planning data shows that the slot should not be empty, install or re-cable the SNI as required. After this service action, refresh the GUI, verify the fix, and continue.
     b. **Miswire**: Review the switch cable planning data for that SNI
        – If the cable connections on the SNI do not match the planning data, re-cable the ports as needed. After this service action, reboot the server (refer to "Managed system power on and power off (LPAR reboot)" on page 159) and repeat step this procedure from the beginning (step 1)
        – If the cable connections match the planning data, then there was a mistake in the planning data that will need to be corrected.
     c. **Faulty**: Review the switch cable planning data. If the SNI is cabled correctly, run diagnostics (refer to "Switch diagnostics" on page 177) and replace FRUs as specified. After this service action, refresh the GUI, verify the fix, and continue.

        Note: If you have a physical location code for the faulty port, you can ignore the first two steps of the switch diagnostic procedure and start with step 3 of that procedure.

7. When you have verified that all SNI hardware is present, continue with step 9 and disable HPSNM

9) Disable HPSNM

1. On the Management Server, open the CSM GUI
2. From the Navigation area of the GUI, open the ″Switch Management″ panel
3. Select ″Switch Network Management″
4. On the HPSNM network management panel, click ″Disable HPSNM software″

10) Enable HPSNM for normal operation

To set normal operating mode, verify that HPSNM is currently disabled, then:

1. On the Management Server, open the CSM GUI
2. From the Navigation area of the GUI, open the ″Switch Management″ panel
3. Select ″Switch Network Management″
4. On the HPSNM Network Management panel, click ″Enable HPSNM Software for Normal Operation″

   Note: Make certain that you select the option for Normal Operation and not the option to ″Enable HPSNM Software for Switch Network Verification.″

Required cluster cold start

You must perform a cluster cold start to bring the network online to a known state from a powered off state. You should do a cluster cold start whenever your installation experiences a power event or when directed to do so by the next level of support. To perform a cluster cold start:

1) Verify that HPSNM is operating in ″Normal Mode″

To set normal operating mode:

1. On the Management Server, open the CSM GUI
2. From the Navigation area of the GUI, open the ″Switch Management″ panel
3. Select ″Switch Network Management″
4. On the HPSNM Network Management panel, click ″Enable HPSNM Software for Normal Operation″

   Note: Make certain that you select the option for Normal Operation and not the option to ″Enable HPSNM Software for Switch Network Verification.″

2) Power off switches in server frames using HPSNM

Using either the HPSNM or `chswpower` command from the HPSNM command line, power off all switches located in server frames. From the GUI:

1. Open the ″Switch Topology View″ panel
2. Select the network containing the switches you want to power off
3. Select the switches to power off
4. From the main menu, click ″Selected″
5. From the drop down menu, select ″Power Off″
6. Confirm the action by clicking the appropriate button

3) Disable HPSNM

1. On the Management Server, open the CSM GUI
2. From the Navigation area of the GUI, open the ″Switch Management″ panel
3. Select ″Switch Network Management″
4. On the HPSNM network management panel, click ″Disable HPSNM software″

4) Power off all servers

Refer to “Managed system power off” on page 160 for this procedure

5) UEPO off all switch-only frames

Place the UEPO switch on each **switch-only** frame in the off position

6) UEPO on all switch-only frames

Place the UEPO switch on each **switch-only** frame in the on position

7) Enable HPSNM for normal operation

To set normal operating mode, verify that HPSNM is currently disabled, then:

1. On the Management Server, open the CSM GUI
2. From the Navigation area of the GUI, open the ″Switch Management″ panel
3. Select ″Switch Network Management″
4. On the HPSNM Network Management panel, click ″Enable HPSNM Software for Normal Operation″

   Note: Make certain that you select the option for Normal Operation and not the option to ″Enable HPSNM Software for Switch Network Verification.″

8) Power on switches in server frames using HPSNM

Using either the HPSNM or `chswpower` command from the HPSNM command line, power on all switches located in server frames. From the GUI:

1. Open the ″Switch Topology View″ panel
2. Select the network containing the switches you want to power on
3. Select the switches to power on
4. From the main menu, click ″Selected″
5. From the drop down menu, select ″Power On″
6. Confirm the action by clicking the appropriate button

9) Disable HPSNM

1. On the Management Server, open the CSM GUI
2. From the Navigation area of the GUI, open the ″Switch Management″ panel
3. Select ″Switch Network Management″
4. On the HPSNM network management panel, click ″Disable HPSNM software″

10) Verify the cluster service network

Verify that the system recognizes each component by making sure that all frames and servers appear on the HPSNM GUI

1. From the Navigation area of the GUI, open the ″Switch Management″ panel
2. Select ″Switch Network Management″
3. On the ″Switch Network Management″ panel, click ″Display Cluster Components″
   - Depending on the size of your network, it may take several minutes for the system to display all network components
   - If the network components are not listed in five minutes, refresh the display
   - If needed, wait an additional five minutes are refresh the display a second time
4. When fully resolved, the ″Display Cluster Components″ selection shows an ID list and item count for switches and servers
   - If the system is unable to resolve the network components, look for problems in the Ethernet components of the cluster service network

     Note: SNIs are not listed in the ″Display Cluster Components″ panel.

11) Enable HPSNM

1. On the Management Server, open the CSM GUI
2. From the Navigation area of the GUI, open the ″Switch Management″ panel
3. Select ″Switch Network Management″

4. On the HPSNM Network Management panel, click ″Enable HPSNM Software for Normal Operation″

   Note: Make certain that you select the option for Normal Operation and not the option to ″Enable HPSNM Software for Switch Network Verification.″

12) Power on all servers
Refer to "Managed system power on" on page 160 for this procedure

FRU identification LEDs

During some service procedures you may need to activate or deactivate a FRU identification LED. This is often done to aid in identifying the proper FRU and to verify either a FRU location code or the frame and cage information provided by the system diagnostics tools. For additional information, refer to:

- "Activating Switch FRU identification LEDs"
- "Deactivating Switch FRU identification LEDs" on page 171

Special instructions for Switch Network Interface LEDs

If the FRU you are trying to identify is a Switch Network Interface (SNI), use the LED activating and deactivating procedures that you would use for a GX bus adapter.

If you obtained the SNI information from a BBxxxxxx serviceable event in SFP, activate and deactivate the LEDs using the SFP Service Utilities on the HMC controlling the server with the SNI.

Refer to the appropriate server documentation for detailed information about these procedures.

Activating Switch FRU identification LEDs

Attention: The procedures in this section are specific to the FRU identification LEDs in the HPS enclosure. For information about activating and deactivating all other system FRU identification LEDs, refer to the service documentation for the specific server type.

To *activate* a switch FRU identification LED for a failing FRU:

1. Obtain the FRU location code and MTMS for the FRU power controlling enclosure (BPA):
   a. Record the FRU location code from the FRU list
   b. Record the unit location code for the FRU, which is the first part of the FRU location code
      - The format for the unit location code is: U[Machine type].[Model].[Serial Number]
      - By deleting the ″U″ from the beginning of the unit location code, you obtain the switch enclosure's MTMS
   c. Double-click the FRU to bring up its properties
   d. Record the power controlling enclosure (BPA) MTMS for the FRU
2. Activate the Switch Enclosure identification LED
   a. Go to the HMC controlling the switch enclosure with the FRU
   b. Open the ″Service Applications″ folder
   c. Open ″Service Focal Point″
   d. Choose the ″Service Utilities″ task
      - This opens the ″Service Utilities″ window
   e. When the ″Service Utilities″ window opens, select the System Unit Bulk Power Assembly having the Machine Type, model number, and serial number that matches the MTMS for the frame BPA that you recorded previously
   f. From the menu in the ″Service Utilities″ window, choose ″Selected-Identify LED processing″
      - This opens the ″Service Utilities-Identify LED, Select Enclosure″ window

g. In the ″Service Utilities-Identify LED, Select Enclosure″ window, select the switch enclosure having the Machine Type, model number, and serial number that matches the MTMS that you recorded from the FRU location code
h. Click the ″Activate LED″ button at the of the bottom of the ″Service Utilities-Identify LED, Select Enclosure″ window to activate the System identification LED on the switch enclosure
   - Use the activated LED to find the switch enclosure

   Notes:
   1) If the switch planar is the FRU, this is the only LED that you need activate to identify the FRU.
   2) If the FRU is **not** the switch planar, then proceed to the next step.
   3) After you replace the FRU, you may have to deactivate the system identification LED on the switch enclosure.

3. Activate the FRU identification LED

   Note: Use this procedure step only if the switch planar is **not** the FRU.

   a. In the ″Service Utilities-Identify LED, Select Enclosure″ window, make sure that the switch planar is still selected, and from the menu, choose ″Selected-List FRUs″
      - This opens the ″Service Utilities-Identify LED, Select Location″ window
   b. In the ″Service Utilities-Identify LED, Select Location″ window, select the FRU that matches the FRU location code you recorded in step 1
   c. Click the ″Activate LED″ button at the of the bottom of the ″Service Utilities-Identify LED, Select Location″ window
   d. Both the System identification LED on the switch enclosure and the FRU identification LED should be lit

   Note: If you do not replace the FRU, you will have to deactivate the FRU identification LED. Refer to “Deactivating Switch FRU identification LEDs.”

Deactivating Switch FRU identification LEDs

Attention: The procedure in this section is specific to the FRU identification LEDs in the HPS enclosure. For information about activating and deactivating all other system FRU identification LEDs, refer to the service documentation for the specific server type.

To *deactivate* a switch FRU identification LED for a failing FRU:

1. If you do not have the location code, obtain the FRU location code and MTMS for the FRU power controlling enclosure (BPA):
   a. Record the FRU location code from the FRU list
   b. Record the unit location code for the FRU, which is the first part of the FRU location code
      - The format for the unit location code is: U[Machine type].[Model].[Serial Number]
      - By deleting the ″U″ from the beginning of the unit location code, you obtain the switch enclosure’s MTMS
   c. Double-click the FRU to bring up its properties
   d. Record the power controlling enclosure (BPA) MTMS for the FRU
2. Deactivate the Switch Enclosure identification LED
   a. Go to the HMC controlling the switch enclosure with the FRU
   b. Open the ″Service Applications″ folder
   c. Open ″Service Focal Point″
   d. Choose the ″Service Utilities″ task
      - This opens the ″Service Utilities″ window

e. When the ″Service Utilities″ window opens, select the System Unit Bulk Power Assembly having the Machine Type, model number, and serial number that matches the MTMS for the frame BPA that you recorded previously

f. From the menu in the ″Service Utilities″ window, choose ″Selected-Identify LED processing″
   - This opens the ″Service Utilities-Identify LED, Select Enclosure″ window

g. In the ″Service Utilities-Identify LED, Select Enclosure″ window, select the switch enclosure having the Machine Type, model number, and serial number that matches the MTMS that you recorded from the FRU location code

h. Click the ″Deactivate LED″ button at the of the bottom of the ″Service Utilities-Identify LED, Select Enclosure″ window to deactivate the System identification LED on the switch enclosure
   - Check the switch enclosure to verify that the LED has been deactivated

   Notes:

   1) If the switch planar is the FRU, this is the only LED that you need to deactivate.

   2) If the FRU is **not** the switch planar, then proceed to the next step.

3. Deactivate the FRU identification LED

   Note: Use this procedure step only if the switch planar is **not** the FRU.

   a. In the ″Service Utilities-Identify LED, Select Enclosure″ window, make sure that the switch planar is still selected, and from the menu, choose ″Selected-List FRUs″
      - This opens the ″Service Utilities-Identify LED, Select Location″ window

   b. In the ″Service Utilities-Identify LED, Select Location″ window, select the FRU that matches the FRU location code you previously recorded

   c. Click the ″Deactivate LED″ button at the of the bottom of the ″Service Utilities-Identify LED, Select Location″ window

   d. Both the System identification LED on the switch enclosure and the FRU identification LED should be off

Running diagnostics from HPSNM

Attention: Some service actions require privileged access to specific HPSNM commands and data on the CSM Management Server. Refer to “Service login ID” on page 56 for information on setting up a user account with secure access.

The High Performance Switch Network Manager procedures for both “SNI (adapter) diagnostics” on page 174 and “Switch diagnostics” on page 177 contain steps for identifying the failing FRUs using Service Focal Point (SFP). However, Service Focal Point has four possible methods of reporting faulty links in the FRU information panel:

1. Both the server side and switch side of the failing link are given in the FRU list (for example a link sync failure)
2. Only the switch side of the failing link is reported
3. Only the server side of the failing link is reported
4. Only a riser (Switch Port Connection card) associated with the failing link is reported

Since there are multiple reporting methods, the listed FRU may only be a symptom of the failure and may not be the actual failing FRU. Because of that, simply replacing the FRU listed in SFP may not fix the problem and will lead to extended service time. Therefore, regardless of how the faulty link is reported, you must run HPSNM diagnostics on both the server side and the switch side of the failing link. The method for doing this is described in “Diagnostic procedures using HPSNM” on page 173.

Notes:

1. Appendix A, “FRU identification codes,” on page 239 lists error codes returned by Service Focal Point.

2. Appendix E, “High Performance Switch Network Manager (HPSNM),” on page 465 has detailed information about HPSNM.
3. For detailed information on HPSNM diagnostic and error recovery functions, refer to “HPSNM diagnostics and error recovery” on page 480. Process descriptions in that section include:
   - “Diagnostics” on page 480
     – “Line continuity” on page 480
     – “Wrap testing” on page 480
     – “Link verification” on page 481
     – “Error Log Analysis (ELA)” on page 481
   - “Error recovery” on page 482

Avoiding miswires during diagnostic procedures

If you exchange cables between SNI ports during a diagnostic procedure, you are likely to cause a miswire on a dual network cluster. If you must exchange cables for fault isolation, you should swap them at the switch end using this set of rules:

- You can only exchange cables that are used for server-to-switch connections
  – Exchanging switch-to-switch cables will always result in a miswire
- **Do not** exchange switch cables at the ports on the SNI (server) end of the cable
- All cable exchanges **must** be done using the ports on the Switch Port Connection cards
- **Do not** exchange cables used for switch-to-switch connections
  – Exchanging switch-to-switch cables will always result in a miswire
- Only exchange cables that are attached to the same switch
  – Exchanging cables attached to different switches may place SNI connections on different networks
- After exchanging cables, check the Switch Topology GUI and verify that those links show a status of Up:Operational
  – If any links are not Up:Operational, follow standard diagnostic procedures

After any repair action or fault isolation procedure that affects links, you should check the Switch Topology panel and the End-Point panel on the HPSNM GUI. Using those panels make sure that all links show a status of Up:Operational. If any links are not Up:Operational, follow standard diagnostic procedures.

Notes:

1. If you must exchange cables between SNI ports, you must reboot the LPARs associated with the SNIs. This requirement is a function of how HPSNM initializes and updates network routes. To minimize changes across the cluster, the system associates physical IDs with the switch endpoint and not with the SNI. Therefore, if you exchange cables at the SNI, you have also exchanged physical IDs and that may require an LPAR reboot to correct. If you need to reboot one or more LPARs, you **must** refer to the instructions in “Managed system power on and power off (LPAR reboot)” on page 159.
2. If you have exchanged cables between SNI ports, the status for those ports on the HPSNM GUI should be ″Down:Re-cable.″
3. **Never** exchange switch-to-switch cables. This will always result in a miswire.

Diagnostic procedures using HPSNM

Should the High Performance Switch network require service, you may have to run diagnostics from High Performance Switch Network Manager (HPSNM). This is the recommended order for running network diagnostics:

1. Run HPSNM diagnostics on the Switch Network Interfaces (refer to “SNI (adapter) diagnostics” on page 174)

2. Run HPSNM diagnostics on the HPS (refer to “Switch diagnostics” on page 177)
3. Run HPSNM diagnostics on the switch network connections (refer to “Faulty port diagnostics” on page 178)
4. Complete any remaining service procedures
5. If the network problem still exists, call the next level of support

SNI (adapter) diagnostics

SNI diagnostics

Problems with Switch Network Interface (SNI) links are diagnosed from High Performance Switch Network Manager (HPSNM). The diagnostic information provided by HPSNM identifies the failure at the chip (adapter) level; it does not directly identify the FRU. However, the HPSNM diagnostic information does reference the service location code for the SNI port which indirectly identifies the FRU. On the GUI, you will see:

- SNI chip (adapter) information consisting of the frame, slot, and adapter location
- SFP error log location codes using the format `UfeatureCode.001.SerialNumber-ComponentIdentifier`

Note: The GUI provides location information from either the ″End Point View″ panel or by using the ″Connected To″ tab on the ″Switch Topology View″ panel.

When you see an adapter reference during SNI diagnostics, do not confuse that use of adapter for the SNI FRU. At the software level, an adapter is a unit that provides full functionality between the server bus and an external SNI link. Depending on the type of IBM @server p5 server an single SNI FRU may have either one or two adapters connected to external SNI links. This means that HPSNM diagnostics may identify:

- Two adapters on a p5-575 server with a single, 2-Link SNI installed
- Up to eight adapters on a p5-590 or p5-595 server with eight 1-Link SNIs installed

In the following procedure, clarifications for HPSNM terms are given in parenthesis. In addition, the server specific location codes for SNIs are listed in:

- Table 35 on page 149 for p5-590 or p5-595 servers
- Table 36 on page 150 for p5-575 servers

If you have a BBXXXXXX error code that lists a switch and SNI (adapter) and the message indicates that you should run diagnostics, use the following procedures to isolate the failing SNI:

1. Identify the switch FRUs involved in the failure
2. Isolate the switch components in the Switch Topology View
3. Identify the SNI connected to the switch components involved in the failure
4. Isolate the SNI port involved in the failure
5. Run diagnostics on the SNI port

1) Identify the FRUs involved in the failure using the Switch Network Management panel

1. Record the frame and ″logical″ cage numbers indicated in the error message

   Note: The system assigns logical cage numbers to each frame slot according to the UPIC plugging order (refer to “Conversions for logical cage number to frame slot location” on page 176).
2. From Service Focal Point (SFP), open the FRU Information panel
3. In the FRU Information Panel, get the list of FRUs and write down all available location codes including:

- Adapters (SNI chips) (Ufc.001.sn-Px-Cy-Tz)
  – Where: fc = feature code, sn = serial number, x = planar, y = connector on planar, and z = connector on card
- Switches (Umt.m.sn-P1)
  – Where: mt = machine type, m = model, and sn = serial number
- Switch Port Connection cards (risers) (Umt.m.sn-P1-Cx-Tn)
  – Where: mt = machine type, m = model, and sn = serial number

4. Exit SFP
5. If SFP returned:
   - An adapter (SNI chip) location code, use the physical location code specified for that SNI in the End-point View
   - A switch or Switch Port Connection card location code and *did not* return an adapter location code, go to the procedure step: ″Isolate the switch components in the Switch Topology View″

2) Isolate the switch components in the Switch Topology View

1. From the menu bar, select ″Switch Management/Switch Network Management″ to open that panel
2. From the drop down menu, select ″Switch Topology View″
3. The Switch Topology View displays all network links but you can limit the display by applying a view filter
4. From the menu, select ″Filter-Edit Filter″
5. Enter the filter information
   - Enter the frame number that you recorded from the error message in the first procedure
   - Enter the logical cage number for the switch frame slot (also recorded in the first procedure)
   - Enter the SPC card and port location (Cx-Tn) in the ″Slot-Riser Port:″ field
6. Press OK
7. On the menu, select ″File-Expand All″
8. Look in the ″Slot-Riser″ column for the Cx-Tn location code that you entered

3) Identify the SNI connected to the switch components involved in the failure

1. Select that switch port listed in the Slot-Riser column
2. On the menu, click ″Selected-Properties″
3. Click on the ″Connected To″ tab
4. Write down the FRU location code for the SNI as well as the port, chip (adapter), frame, and frame slot (cage) listed on the HPSNM GUI
   - In this instance, chip (adapter) refers to the internal components of an SNI
   - You will use these location codes to identify the SNI (adapter) connected to the Cx-Tn switch port
5. Close the ″Properties″ window

4) Isolate the SNI port involved in the failure

1. Open the ″Switch Management/Switch Network Management″ panel
2. Open the ″End Point View″
3. The End Point View displays all network links but you can limit the display by applying a view filter
4. On the menu, select ″Filter-Edit Filter″
5. Enter the port, chip (adapter), frame, and slot information taken from the ″Connected To″ panel
   - Enter the frame number in the Frame field
   - Enter the frame slot number in the Cage field
   - Enter the chip number in the Adapter field (in this instance, Adapter refers to the internal components of an SNI FRU)

- Enter the port number for the SNI external link in the Port field

6. Click OK
7. On the menu, select ″File-Expand All″
8. Only one port should be listed and it should correspond to the frame, cage, chip (adapter), and port that you entered in the filter

5) Run diagnostics on the SNI port

1. Select the port you want to diagnose

   Note: If **any** diagnostics fail and point to a FRU, go to step 5b.
2. On the menu, click ″Selected-Diagnose-Verify Link″
3. If the above does not fail and point to a FRU, click ″Selected-Diagnose-Line Continuity Test″
4. If the above does not fail and point to a FRU, click ″Selected-Diagnose-Wrap Test″
   - During the wrap test you will be asked to use wrap assemblies supplied with the diagnostic tool kit
5. If:
   a. The SNI port diagnostics do not reveal the problem, go to “Switch diagnostics” on page 177
   b. The SNI port diagnostics indicate a problem:
      1) Replace the failing FRU
      2) Rerun the SNI port diagnostics to make sure the problem is fixed
      3) Go to “Switch diagnostics” on page 177
   c. All network problems are resolved, follow the remaining steps in the service procedure that brought you here
   d. You have completed all service procedures and the problem still exists, call the next level of support

Conversions for logical cage number to frame slot location: Table 37 lists the logical cage numbers (based on UPIC plugging order) and the equivalent frame slot location for p5-590 and p5-595 server frames.

Table 37. Frame slot locations for p5-590 and p5-595 server frames

Logical cage number	Frame slot location
0	18 (CEC)
1	9
2	5
3	1 (typical switch location)
4	13

Table 38lists the logical cage numbers (based on UPIC plugging order) and the equivalent frame slot location for p5-575 server frames.

Table 38. Frame slot locations for p5-575 server frames

Logical cage number	Frame slot location
0	1
1	2
2	5
3	6
4	9

Table 38. Frame slot locations for p5-575 server frames (continued)

Logical cage number	Frame slot location
5	10
6	13
7	14
8	19
9	20
10	23
11	24
12	27
13	28
14	31
15	32

Switch diagnostics

If you have a prefix BB error code that lists a switch and SNI (adapter) and the message indicates that you should run diagnostics, use the following procedure to isolate the switch failure:

1. Identify the switch FRUs involved in the failure using Service Focal Point
2. Isolate the switch components in the Switch Topology View
3. Run diagnostics on the switch

1) Identify the switch FRUs involved in the failure using Service Focal Point

1. Record the frame and ″logical″ cage numbers indicated in the error message

   Notes:

   a. You can find the frame and cage numbers in the ″Manage Serviceable Events″ view.″ Look on the ″Serviceable Event Overview″ panel under ″Serviceable Event.″
   b. The system assigns logical cage numbers to each frame slot according to the UPIC plugging order (refer to "Conversions for logical cage number to frame slot location" on page 176).
2. From Service Focal Point (SFP), open the FRU Information panel
3. In the FRU Information Panel, get the list of FRUs and write down all available location codes including:
   - Switches (Umt.m.sn-P1)
     – Where: mt = machine type, m = model, and sn = serial number
   - Switch Port Connection cards (risers) (Umt.m.sn-P1-Cx-Tn)
     – Where: mt = machine type, m = model, and sn = serial number
4. Exit SFP
5. Go to the procedure step: ″Isolate the switch components in the Switch Topology View″

2) Isolate the switch components in the Switch Topology View

1. From the menu bar, select ″HPS Network Management″ to open that panel
2. From the drop down menu, select ″Switch Topology View″
   - As an alternate method, right click on the error in the ″Event Details″ panel and then choose ″Switch Diagnostics - Switch Topology View″
3. The Switch Topology View displays all network links but you can limit the display by applying a view filter
4. From the menu, select ″Filter-Edit Filter″
5. Enter the filter information

- Enter the frame number that you recorded from the error message in the first procedure
- Enter the logical cage number for the switch frame slot (also recorded in the first procedure)
- Enter the SPC card and port location (Cx-Tn) in the ″Slot-Riser Port:″ field

6. Press OK
7. On the menu, select ″File-Expand All″
8. Look in the ″Slot-Riser″ column for the Cx-Tn location code that you entered

3) Run diagnostics on the switch

1. Select the port you want to diagnose

   Note: If **any** diagnostics fail and point to a FRU, go to step 5b.
2. On the menu, click ″Selected-Diagnose-Verify Link″
3. If the above does not fail and point to a FRU, click ″Selected-Diagnose-Line Continuity Test″
4. If the above does not fail and point to a FRU, click ″Selected-Diagnose-Wrap Test″
   - During the wrap test you will be asked to use wrap assemblies supplied with the diagnostic tool kit
5. If:
   a. The switch diagnostics do not reveal the problem and you have not run diagnostics on the other end of the link:
      - If the other end of the link is a server-to-switch connection, go to “SNI (adapter) diagnostics” on page 174
      - If the other end of the link is a switch-to-switch connection, go to “Switch diagnostics” on page 177

   b. The switch diagnostics indicate a problem:
      1) Replace the failing FRU
      2) Rerun the switch diagnostics to make sure the problem is fixed
      3) If the problem is fixed and:
         - You have not run diagnostics on the other end of the link:
           – If the other end of the link is a server-to-switch connection, go to “SNI (adapter) diagnostics” on page 174
           – If the other end of the link is a switch-to-switch connection, go to “Switch diagnostics” on page 177
         - All network problems are resolved, follow the remaining steps in the service procedure that brought you here

   c. All network problems are resolved, follow the remaining steps in the service procedure that brought you here

   d. You have completed all service procedures and the problem still exists, call the next level of support

Faulty port diagnostics

Use the “Faulty port diagnostics procedure” on page 181 to determine if a switch network has:

- A missing Switch Port Connection (SPC) card or SNI
- A miswired switch cable
- A faulty SPC card or SNI

Before you begin: Before you begin the “Faulty port diagnostics procedure” on page 181, you **must** perform the network verification procedures listed in this section.

Note: Some network configurations may be difficult for the faulty port diagnostic procedure to interpret. Please review “Unexpected errors” on page 180 for information about these configurations.

1) Verify that all switches are powered on

Using High Performance Switch Network Manager on the CSM Management Server:

1. Open the ″Switch Topology View″ panel
2. From the main menu, click ″File″ and select ″Expand All″
3. From the main menu, click ″Filter″
   a. From the drop down menu, select ″Edit Filter″
   b. Select ″Port Status″
   c. Select ″Powered Off″ as the filtering criteria
      - **Note:** With this filter, the system check will only display switches that are powered off. If a switch is powered on, it will not display on the GUI screen.
4. If any switches are power off:
   a. Power the switch on
   b. Restart HPSNM
   c. Refresh the GUI
5. The refreshed display should not show any switches powered off
   - If the GUI still shows switches powered off, call the next level of support

2) Verify that all comm ports are functional

Using High Performance Switch Network Manager on the CSM Management Server:
1. Open the ″Switch Topology View″ panel
2. From the main menu, click ″File″ and select ″Expand All″
3. From the main menu, click ″Filter″
   a. From the drop down menu, select ″Edit Filter″
   b. Select ″Port Status″
   c. Select ″Comm Port Down″ as the filtering criteria
      - **Note:** With this filter, the system check will only display comm ports that are not functional.
4. If any communication ports are not functioning:
   a. Check the Ethernet connectors on the cluster service network
   b. Check the cluster service network Ethernet cables
   c. Restart HPSNM and rerun the Comm Port Down test
   d. Refresh the GUI
5. The refreshed display should not show any faulty communication port
   - If the GUI still shows faulty communication ports and all cables are correctly attached, call the next level of support

3) Verify that the GUI does not show any ports with a status of Down:Re-cabled

Using High Performance Switch Network Manager on the CSM Management Server:
1. Open the ″Switch Topology View″ panel
2. From the main menu, click ″File″ and select ″Expand All″
3. From the main menu, click ″Filter″
   a. From the drop down menu, select ″Edit Filter″
   b. Select ″Port Status″
   c. Select ″Down:Re-cabled″ as the filtering criteria
4. If any ports display a status of Down:Re-cabled:
   a. Highlight the identified port
   b. On the menu bar, click ″Selected-Properties″
   c. Click the ″Connected To″ tab
5. The information on the ″Connected To″ panel identifies the SNI connected to the re-cabled switch port
   a. Record the server MTMS and location code
   b. If the SNI is mounted in a:
      - p5-575 server
        1) From the Management Server, telnet into the server
        2) Get the physical location code for the SNI by issuing the command `lscfg -vp`
        3) Reboot the LPAR for that location code
      - p5-590 or p5-595server
        1) Ask the System Administrator which LPARs are associated with the server identified by the MTMS and location code

– If the System Administrator supplies you with a list of LPARs:
  a) Have the System Administrator issue the following command from the Management Server
     - `dsh -w [LPAR1,LPAR2,...,LPARn] "lscfg -vp|grep [physical location code of SNI]"`
  b) The information returned lists the LPAR name in the first field of the output
  c) Have the System Administrator reboot the LPAR

– If the System Administrator cannot supply you with a list of LPARs:
  a) Have the System Administrator issue the following command from the Management Server:
     - `dsh -av "lscfg -vp|grep [physical location code of SNI]"`
  b) The information returned lists the LPAR name in the first field of the output
  c) Have the System Administrator reboot the LPAR

2) From the Management Server, telnet into the server
3) Get the physical location code for the SNI by issuing the command `lscfg -vp`
4) Reboot the LPAR for that location code

4) Verify that the GUI does not list any system events

Using High Performance Switch Network Manager on the CSM Management Server:

1. Open the ″Switch Topology View″ panel
2. From the main menu, click ″File″ and select ″Expand All″
3. From the main menu, click ″Filter″
   a. From the drop down menu, select ″Edit Filter″
   b. Select ″Port Status″
   c. Select ″System Events″ as the filtering criteria
4. Refresh the GUI
5. If the GUI reports any system events, contact Level 2 software support.

5) Verify that the GUI does not show any network components with a status of ″Working″

Using High Performance Switch Network Manager on the CSM Management Server:

1. Open the ″Switch Topology View″ panel
2. From the main menu, click ″File″ and select ″Expand All″
3. From the main menu, click ″Filter″
   a. From the drop down menu, select ″Edit Filter″
   b. Select ″Port Status″
   c. Select ″Working″ as the filtering criteria
4. Refresh the GUI
5. Continue refreshing the GUI until no items are displayed as working
   - If you have been refreshing the GUI for more than five minutes and items are still displayed as working, call the next level of support.

6) Check Service Focal Point

Look for open error reports in SFP on:

- The ELA Master HMC
- All HMCs controlling network components

Note: When checking SFP, use the Manage Serviceable Events GUI panel.

Unexpected errors: In some cases, the faulty port diagnostic tool may encounter problems distinguishing a port that was intentionally left open from a port that was either miswired or accidentally left open. In addition, the diagnostic tool may also encounter problems distinguishing an open port from a slot with a faulty SPC card or SNI installed. As a result of these diagnostic problems, you may see an error report associated with a port that was intentionally left open. For the faulty port diagnostic procedure, you need to consider these invalid messages as *expected* errors.

While a planned hardware configuration may generate an expected error, an actual problem in the hardware configuration will generate an valid error message. In this example, a hardware configuration problem may result from a miswire, a faulty device, or a switch port that was accidentally left open. Since a valid error message would not be expected, these *unexpected* error messages indicate a valid problem report that you will need to investigate. As part of the investigation, you may need to refer to the network planning information before you can determine if the error message is *unexpected*. If you do encounter an *unexpected* network problem between a SPC card and the associated SNI ports, use the “Faulty port diagnostics procedure” to isolate the problem.

Note: Refer to “Network status codes on HPSNM” on page 271 for a listing and description of the error messages reported through HPSNM using the CSM Management Server.

Faulty port diagnostics procedure:

1. From HPSNM, check the status of the switch network:
   a. Open the ″Switch Topology View″ panel and verify that all switches are present
   b. If some switches are missing, return to “Before you begin” on page 178
2. From HPSNM, check the status of ports 4, 5, 6, and 7:
   a. Open the ″Switch Topology View″ panel
   b. From the main menu, click ″File″ and select ″Expand All″
   c. From the main menu, click ″Filter″
      1) From the drop down menu, select ″Edit Filter″
      2) Select ″Port Status″
      3) If this is:
         - The first time through this procedure, select ″Not Operational″ as the filtering criteria
         - The second time through this procedure, select ″Svc Required″ as the filtering criteria
         - **Note:** With this filter, the system check will only display network components with problems. If a component is OK, it will not display on the GUI screen. However, if your network has unused links, the Switch Topology View sees this as a faulty connection and displays a status of either Not Operational, Svc Required, or both for that location.
   d. The refreshed display shows all switch planar ports across the entire network that have a status of:
      ″Not Operational″ for the first time through this procedure
      ″Svc Required″ for the second time through this procedure
      Note: If the display **does not** show ″Not Operational″ for ports 4, 5, 6, or 7 or ″Svc Required″ for any port, continue with step 3.
   e. If the display shows a status of ″Not Operational″ for ports 4, 5, 6, or 7 or ″Svc Required″ for any port:
      1) The problem is on a switch planar, ignore any errors reported on ports 0, 1, 2, or 3
      2) Determine which planar is reporting the fault
      3) Replace the planar
      4) Refresh the GUI display
      5) When the display does not show a status of ″Not Operational″ for ports 4, 5, 6, or 7 or a ″Svc Required″ on any port, check status of chip ports 0, 1, 2, and 3 (step 3.)
3. Check the status of ports 0, 1, 2, and 3
   a. Refresh the GUI display for Switch Topology View
   b. If the display **does not** show a status of ″Not Operational″ for ports 4, 5, 6, or 7 or ″Svc Required″ for any port but **does** show a status of ″Not Operational″ or ″Svc Required″ for ports 0, 1, 2, or 3, this indicates three possible conditions:
      Note: If the display does not show bad status for any component, continue with step 4.
      1) **Empty**: There is a Switch Port Connection card slot on the switch that is either filled with a blank connection card or it is empty. You will need to review the switch cable planning data and determine whether or not that slot was supposed to have a functioning Switch Port Connection card installed.
         - If the slot is blank and this matches the planning data, ignore this error and continue.
         - If the planning data shows that the slot should not be blank, re-cable the connection card as required. After this service action, refresh the GUI, verify the fix, and continue.
      2) **Miswire**: Review the switch cable planning data for that Switch Port Connection card

- If the cable connections on the Switch Port Connection card do not match the planning data, re-cable the ports as needed. After this service action, refresh the GUI, verify the fix, and continue.
- If the cable connections match the planning data, then there was a mistake in the planning data that will need to be corrected.

3) **Faulty**: Review the switch cable planning data. If the connection card is cabled correctly, run diagnostics (refer to “Switch diagnostics” on page 177) and replace FRUs as specified. After this service action, refresh the GUI, verify the fix, and continue.

Note: If you have a physical location code for the faulty port, you can ignore the first two steps of the switch diagnostic procedure and start with step 3 of that procedure.

4. If the Switch Topology View display does not show any *unexpected* errors (refer to “Unexpected errors” on page 180), go to the End-Point View in HPSNM and verify that all CECs and SNIs are present

Note: Blank Switch Port Connection cards that are in the proper location will display Not Operational, Svc Required, or both as a status in the Switch Topology View. However, these errors are *expected* and can be ignored.

5. From the End-Point View, check the status of the CECs and SNIs associated with each server:
   a. Open the ″End-Point View″ panel
   b. From the main menu, click ″File″
      - From the drop down menu, select ″Expand All″
   c. From the main menu, click ″Filter″
      1) From the drop down menu, select ″Edit Filter″
      2) Select ″Port Status″
      3) If this is:
         - The first time through this procedure, select ″Not Operational″ as the filtering criteria
         - The second time through this procedure, select ″Svc Required″ as the filtering criteria
   d. Check the status of adapter port 0
      - If the display **does not** show status of ″Not Operational″ or ″Svc Required″ for any adapter port 0, continue with step 6.
      - If the status of any adapter port 0 is reported as ″Not Operational″ or ″Svc Required,″ continue with step 5e.
   e. If the display shows a status of ″Not Operational″ or ″Svc Required″ for adapter port 0, this indicates three possible conditions:
      1) **Empty**: There is an SNI slot that is empty or not cabled. You will need to review the switch cable planning data and determine whether or not that slot was supposed to have an SNI installed.
         - If the slot is empty and this matches the planning data, ignore this error and continue.
         - If the planning data shows that the slot should not be empty, install or re-cable the SNI as required. After this service action, refresh the GUI, verify the fix, and continue.
      2) **Miswire**: Review the switch cable planning data for that SNI
         - If the cable connections on the SNI do not match the planning data, re-cable the ports as needed. After this service action, refresh the GUI, verify the fix, and continue.
         - If the cable connections match the planning data, then there was a mistake in the planning data that will need to be corrected.
      3) **Faulty**: Review the switch cable planning data. If the SNI is cabled correctly, run diagnostics (refer to “Switch diagnostics” on page 177) and replace FRUs as specified. After this service action, refresh the GUI, verify the fix, and continue.

         Note: If you have a physical location code for the faulty port, you can ignore the first two steps of the switch diagnostic procedure and start with step 3 of that procedure.

6. If:
   - The *unexpected* problem has not been corrected, contact the next level of support
   - All *unexpected* problems have been resolved, return to the procedure that brought you here

Note: When the HPSNM GUI does not show any *unexpected* errors (status of ″Not Operational″ or ″Svc Required″) in both the Switch Topology View and the End-Point View, the problem associated with a faulty port connection has been corrected and verified.

Determining locations for symbolic FRU

Symbolic FRU concepts

If the system cannot fully resolve the part number for a failing FRU or if the FRU location code is completely or partially unknown, the system will create a *symbolic FRU* to help you identify the component. When the system creates a symbolic FRU, SFP places that information in the ″Part number″ field of the ″Serviceable Event Details″ panel. SFP generates symbolic FRUs for the following components:

- "HPSSPCC: Symbolic FRUs for Switch Port Connection (SPC) cards" on page 184
- "HPSASNI: Symbolic FRUs for Switch Network Interfaces (SNIs)" on page 186
- "HPSA575: Symbolic FRUs for p5-575 server SNIs" on page 189
- "HPSA590: Symbolic FRUs for p5-590 and p5-595 server SNIs" on page 191
- "HPSSSW: Symbolic FRUs for HPS planars" on page 194

Note: Because it is not possible to determine the associated part numbers, switch cables always have a symbolic FRU. To determine a switch cable part number, you will have to look at the cable label. The following symbolic FRUs are associated with switch cables:

- **HPSCAB** – represents a cable if the switch cable type (fiber optic or copper) is not known
- **HPSCCOP** – represents copper switch cables
- **HPSCFIB** – represents fiber optic switch cables

You will usually find symbolic FRUs imbedded in the text for a serviceable event when you are using the ″Repair Serviceable Event″ function of Service Focal Point. However, you can also access the symbolic FRU procedures using the system Information Center. On the Information Center, these procedures are listed in the ″Service Provider Information″ panel under ″Isolating Problems.″

Partial location codes

The system creates partial location codes when there is a problem obtaining the location code from a service processor or in obtaining VPD information used to build the location code. Partial location codes use a ″#″ symbol as a placeholder for any unknown portions.

For example, a switch planar may be represented as U7045.SW4.#######-P1, because the serial number is unknown. However in this example, one end of the cable has a valid location code. With that information, you can use the HPSNM ″Switch Topology View″ and follow the procedure to finding the component at the other end of the cable. From that, you can retrieve the planar location using the frame and slot information.

When you encounter a partial location code, you will need to isolate the component. You can find these isolation procedures at the beginning of the serviceable event report in SFP. When you use the ″Repair Serviceable Event″ function, SFP also opens up an Isolate Procedure document on the Information Center.

Note: Isolation procedures are identified in the ″FRU Class″ column of the FRU list.

The HPS uses the following isolation procedures:

- HPS0000 = Generic FRU isolation procedure
- HPSS001 = Generic Isolation procedure for switch reported event
- HPSA001 = Generic Isolation procedure for SNI reported event

Outside of the SFP ″Repair Serviceable Event″ function, you can access an Isolate Procedure from the Information Center:

1. In the left Navigation panel, click on ″Service Provider Information″
2. Click on ″Isolating Problems″
3. Click on ″Isolation Procedures″
4. Click on ″High Performance Switch″
5. In the main panel, look for the Isolate Procedure name that you obtained from the FRU list and click on it
6. Follow the instructions in the Isolate Procedure

HPSSPCC: Symbolic FRUs for Switch Port Connection (SPC) cards

Finding ″HPSSPCC″ in the FRU ″Part number″ field on the SFP Serviceable Event Details panel, indicates that SFP was not able to resolve the system data for a Switch Port Connection (SPC) card. A symbolic FRU does not automatically indicate that a component requires service. However, if that FRU does require service, and if you have isolated the cause of the serviceable event to an SPC card, then you will have to use the procedures in this section to isolate the FRU.

There are two reasons for a Symbolic FRU being displayed instead of a part number:

- VPD is unavailable so the part number is unknown
- The location code for the switch planar is not fully known
  - The ″#″ symbol will be used as a placeholder in the location code (for example: U####.###.#######-P1-C5)
  - The card number (Cx) should always be provided in the location code

If you have a valid SPC card location code

A valid location code does not have any ″#″ characters. If this is the case, do the following:

1. Determine if this Switch Port Connection Card is for fiber cables, or copper cables
2. Look up the appropriate Switch Port Connection Card part number in the Chapter 11, “Parts catalog,” on page 209

If you do not have a valid SPC card location code

You will need to determine the location and part number for the SPC card. The basic steps for determining the FRU information are as follows:

1. Record the available information
2. Determine the switch planar into which the SPC card is plugged
3. Determine which card is the correct SPC card in the switch planar and verify if possible
4. Record the part number for the SPC card

If you **do not** have a valid SPC card location code:

1. Record the frame and slot information from the Serviceable Event text
2. Record the reference code for the Serviceable Event
3. Record the reference code extension for the Serviceable Event
4. Using the information you recorded from the FRU list, determine which of the following procedures will help you find the switch with the failing SPC card
   - If the FRU list shows **two SPC cards** and:
     - One of the SPC cards has a valid location code:
       a. Record, the location of the SPC card with the valid location
       b. Go to the HPSNM Switch Topology View on the CSM Management Server
       c. Find the Switch Port Connection card location that you recorded and click on it
       d. Click on ″Selected-Properties″

e. Click on the ″Connected-To″ tab
    - If the location code for the other SPC card in the ″Connected-To″ tab is valid, use that location code
    - If the location code in the ″Connected-To″ tab is not valid:
        - Record, the frame and slot of the port on the other side of the cable
        - This frame and slot will indicate the location of the switch planar into which the SPC card is plugged
        - Continue on to get the card number of the SPC card

– Both SPC cards do not have a valid location code and this is the first SPC card in the FRU list:
    a. The frame and slot information that you recorded from the Serviceable Event will indicate the location of the switch with the SPC card
    b. Continue on to get the card number of the SPC card

– Both SPC cards do not have a valid location code and this is the second SPC card in the FRU list:
    a. The reference code extension that you recorded from the Serviceable Event will indicate the port location on the other switch
    b. Use the following reference code positions to convert the extensions:
        - Characters 1 through 5 – reserved, set to 0
        - Character 6 – network
        - Characters 7 through 9 – frame number
        - Characters 10 and 11 – slot number
        - Characters 12 and 13 – reserved
        - Character 14 – card
        - Character 15 – chip
        - Character 16 – port
        - For example, reference code 0000000040303312 yields the location: network 0, frame 004, slot 03, (ignore next two characters), card 3, chip 1, port 2
    c. Go to the HPSNM Switch Topology View on the CSM Management Server
    d. Find the row that matches the frame, slot, chip, and port numbers that you recorded and click on that row
    e. Click on ″Selected-Properties″
    f. Click on the ″Connected-To″ tab
        - If the location code in the ″Connected-To″ tab is valid, use that location code
        - If the location code in the ″Connected-To″ tab is not valid:
            1) Record the frame and slot of the port on the other side of the cable
            2) That frame and slot indicates the location of the switch planar with the SPC card
            3) Continue on to get the card number of the SPC card

- If the FRU list shows **one SPC card and one SNI** and:
    – The SNI has a valid location code:
        a. Record the location code for the SNI
        b. Go to the HPSNM End Point View on the CSM Management Server
        c. Find the row that matches the recorded location code for the SNI and click on it
        d. Click on ″Selected-Properties″
        e. Click on the ″Connected-To″ tab
            - If the location code in the ″Connected-To″ tab is valid, use that location code
            - If the location code in the ″Connected-To″ tab is not valid:
                1) Record, the frame and slot of the port on the other side of the cable
                2) That frame and slot indicates the location of the switch planar with the SPC card

3) Continue on to get the card number of the SPC card

– The SNI does not have a valid location code:
  - If the reference code you recorded begins with BB10, BB20, or BB50:
    a. The frame and slot listed in the Serviceable Event will locate the switch planar
    b. Continue on to get the card number of the SPC card
  - If the reference code that you recorded begins with BB30 or BB40:
    a. Use the following reference code positions to convert the extensions:
       - Characters 1 through 5 – reserved, set to 0
       - Character 6 – network
       - Characters 7 through 9 – frame number
       - Characters 10 and 11 – slot number
       - Characters 12 and 13 – reserved
       - Character 14 – card
       - Character 15 – chip
       - Character 16 – port
       - For example, reference code 0000000040512330 yields the location: network 0, frame 004, slot 05, (ignore next two characters), card 3, chip 3, port 0
    b. Go to the HPSNM End Point View on the CSM Management Server
    c. Find the row that matches the frame, slot, chip, and port numbers and click on that row
       - Chip numbers are labeled ″Adapter number″ on the GUI
    d. Click on ″Selected-Properties″
    e. Click on the ″Connected-To″ tab
       - If the location code in the ″Connected-To″ tab is valid, use that location code
       - If the location code in the ″Connected-To″ tab is not valid:
         1) Record the frame and slot of the port on the other side of the cable
         2) That frame and slot indicate the location of the switch planar with the SPC card
         3) Continue on to get the card number of the SPC card

- If the FRU list shows **one switch planar but does not show an SNI**:
  a. The frame and slot listed in the Serviceable Event will locate the switch planar
  b. Double check the planar location by:
     1) Open the HPSNM Switch Topology View
     2) Finding the switch in the frame and slot listed above
     3) Using the GUI, expand the ports to see if there is a valid location code for any of the ports
     4) If there is, you can drop the ″-Cx-Ty″ to get the location code for the switch

5. At this point, you should have the location for the switch planar with the SPC card. The card number (Cx) in the location code for the SPC card in question will indicate the SPC card plugged into the switch planar. It is possible that by the time you reach this step, you have found the entire location code for the SPC card, and can continue on to the next step.
6. Try to verify that there is a flashing LED on the SPC card you have identified
   - The lack of a flashing LED is not a positive indicator that this is not the correct SPC card.
7. You can get the part number by looking on the part itself and cross-referencing to the Chapter 11, “Parts catalog,” on page 209

HPSASNI: Symbolic FRUs for Switch Network Interfaces (SNIs)

Finding ″HPSANSI″ in the FRU ″Part number″ field on the SFP Serviceable Event Details panel, indicates that SFP was not able to resolve the system data for a Switch Network Interface (SNI). A symbolic FRU does not automatically indicate that a component requires service. However, if that FRU does require service, and if you have isolated the cause of the serviceable event to an SNI, then you will have to use the procedures in this section to isolate the FRU.

There are two reasons for a Symbolic FRU being displayed instead of a part number:

- VPD is unavailable so the part number is unknown
- The location code for the switch planar is not fully known
  – The ″#″ symbol will be used as a placeholder in the location code (for example: U####.###.#######-P#-C#)

If you have a valid SNI location code
A valid location code does not have any ″#″ characters. If this is the case:

1. Determine the server type for the SNI location
   - If the server is a p5-575, you will be looking for a 2-Link SNI
   - If the server is a p5-590 or p5-595, you will be looking for a 1-Link SNI
2. Look up the appropriate SNI part number in the Chapter 11, “Parts catalog,” on page 209

If you do not have a valid SNI location code
You will need to determine the location and part number for the SNI. The basic steps for determining the FRU information are as follows:

1. Record the available information
2. Determine the server location for the SNI
3. If possible, verify that you have the correct FRU
4. Record the SNI part number

If you **do not** have a valid SNI location code:

1. Record the frame and slot information from the Serviceable Event text
2. Record the reference code for the Serviceable Event
3. Record the reference code extension for the Serviceable Event
4. Using the information you recorded from the FRU list, determine which of the following procedures will help you find the server with the failing SNI
   - If the FRU list shows **an SNI and an SPC card** and:
     – The SPC card has a valid location code:
       a. Record, the location of the SPC card with the valid location
       b. Go to the HPSNM Switch Topology View on the CSM Management Server
       c. Find the Switch Port Connection Card location that you recorded and click on it
       d. Click on ″Selected-Properties″
       e. Click on the ″Connected-To″ tab
          - If the location code for the SNI in the ″Connected-To″ tab is valid, use that location code for the SNI.
          - If the location code in the ″Connected-To″ tab is not valid, refer to your cable planning documentation or a cable label to determine which SNI is connected to this SPC card port
     – Both the SNI and the SPC card do not have a valid location code and the reference code you recorded begins with BB10, BB20 or BB50:
       a. The frame and slot information you recorded from the Serviceable Event indicates the location of the switch
       b. The location code characters that indicate the SPC card number (Cx) should be valid
       c. Go to the HPSNM Switch Topology View on the CSM Management Server
       d. Find the Switch Port Connection card location that you recorded and click on it
       e. Click on ″Selected-Properties″
       f. Click on the ″Connected-To″ tab
          - If the location code is valid in the ″Connected-To″ tab, use that location code for the SNI

- If the location code is not valid in the ″Connected-To″ tab, refer to the cable planning documentation, the cable labels, or trace the cable to determine which SNI is connected to the SPC card port

– Both the SNI and the SPC card do not have a valid location code and the reference code you recorded begins with BB30, or BB40:

   a. The reference code extension you recorded from the Serviceable Event indicates the logical location of the failing SNI port

   b. Use the following reference code positions to convert the extensions:
      - Characters 1 through 5 – reserved, set to 0
      - Character 6 – network
      - Characters 7 through 9 – frame number
      - Characters 10 and 11 – slot number
      - Characters 12 and 13 – reserved
      - Character 14 – card
      - Character 15 – chip
      - Character 16 – port
      - For example, reference code 0000000040512330 yields the location: network 0, frame 004, slot 05, (ignore next two characters), card 3, chip 3, port 0

   c. Go to the HPSNM End Point View on the CSM Management Server

   d. Find the row that matches the location for the frame, slot, chip, and port numbers that you recorded, and click on that row

      Note: On the HPSNM, chip numbers are labeled ″Adapter Number.″

      - If the location code in the GUI is valid, use that location code for the SNI
      - If the location code is not valid:
        1) Click on ″Selected-Properties″
        2) Click on the ″Connected-To″ tab
        3) Get a location for the SPC card:
           • If the location code is valid in the ″Connected-To″ tab, this is the SPC card to which the SNI is connected
           • If the location code is not valid in the ″Connected-To″ tab, use the following to determine the SPC card to which the SNI is connected:
             a) Record, the frame and slot of this SPC card
             b) That information indicates the switch planar to which the SPC card is connected
             c) The SPC card number (Cx) in the location code should be valid, use that information to find the specific SPC card plugged into the switch planar
        4) Using the cable planning documentation, a cable label, or by tracing the switch cable, determine which SNI is connected to this SPC card port

• If the FRU list shows **an SNI but does not show an SPC card**:

   a. The frame and slot you recorded from the Serviceable Event will locate the server CEC with the failing SNI

   b. Use the following reference code positions to convert the extensions:
      – Characters 1 through 5 – reserved, set to 0
      – Character 6 – network
      – Characters 7 through 9 – frame number
      – Characters 10 and 11 – slot number
      – Characters 12 and 13 – reserved
      – Character 14 – card
      – Character 15 – chip
      – Character 16 – port

– For example, reference code 0000000040512110 yields the location: network 0, frame 004, slot 05, (ignore next two characters), card 1, chip 1, port 0

c. Open the HPSNM End Point View on the CSM Management Server

d. Find the row that matches the location for the frame, slot, chip, and port numbers that you recorded, and click on that row

Note: On the HPSNM, chip numbers are labeled ″Adapter Number.″

e. Click on ″Selected-Properties″
   – If the location code is valid, use that for the SNI location
   – If the location code is not valid, but you can determine that there is only one SNI in the CEC at the frame and slot location you identified, then that is the location for the failing SNI
   – If the location code is not valid and there is more than one SNI in the CEC at the frame and slot location you identified, call the next level of support

5. Before replacing the SNI, make sure that you have run the appropriate diagnostic procedures
6. Try to verify that there is a flashing LED on the SNI card you are going to service
   - The lack of a flashing LED is not a positive indicator that this is not the correct SNI
7. You can get the part number by looking on the part itself and cross-referencing to the Chapter 11, “Parts catalog,” on page 209

HPSA575: Symbolic FRUs for p5-575 server SNIs

Finding ″HPSA575″ in the FRU ″Part number″ field on the SFP Serviceable Event Details panel, indicates that SFP was not able to resolve the system data for a Switch Network Interface (SNI) in a p5-575 server. A symbolic FRU does not automatically indicate that a component requires service. However, if that FRU does require service, and if you have isolated the cause of the serviceable event to an SNI in a p5-575 server, then you will have to use the procedures in this section to isolate the FRU.

There are two reasons for a Symbolic FRU being displayed instead of a part number:
- VPD is unavailable so the part number is unknown
- The location code for the switch planar is not fully known
  – The ″#″ symbol will be used as a placeholder in the location code (for example: U####.###.#######-P#-C#)

If you have a valid SNI location code

A valid location code does not have any ″#″ characters. If this is the case, look up the part number for a 2-Link SNI in the Chapter 11, “Parts catalog,” on page 209

If you do not have a valid SNI location code

You will need to determine the location and part number for the SNI. The basic steps for determining the FRU information are as follows:
1. Record the available information
2. Determine the server location for the 2-Link SNI
3. If possible, verify that you have the correct FRU
4. Record the SNI part number

If you **do not** have a valid SNI location code:
1. Record the frame and slot information from the Serviceable Event text
2. Record the reference code for the Serviceable Event
3. Record the reference code extension for the Serviceable Event
4. Using the information you recorded from the FRU list, determine which of the following procedures will help you find the server with the failing SNI
   - If the FRU list shows **an SNI and an SPC card** and:

– The SPC card has a valid location code:
  a. Record, the location of the SPC card with the valid location
  b. Go to the HPSNM Switch Topology View on the CSM Management Server
  c. Find the Switch Port Connection Card location that you recorded and click on it
  d. Click on ″Selected-Properties″
  e. Click on the ″Connected-To″ tab
     - If the location code for the SNI in the ″Connected-To″ tab is valid, use that location code for the SNI.
     - If the location code in the ″Connected-To″ tab is not valid, refer to your cable planning documentation or a cable label to determine which SNI is connected to this SPC card port
– Both the SNI and the SPC card do not have a valid location code and the reference code you recorded begins with BB10, BB20 or BB50:
  a. The frame and slot information you recorded from the Serviceable Event indicates the location of the switch
  b. The location code characters that indicate the SPC card number (Cx) should be valid
  c. Go to the HPSNM Switch Topology View on the CSM Management Server
  d. Find the Switch Port Connection card location that you recorded and click on it
  e. Click on ″Selected-Properties″
  f. Click on the ″Connected-To″ tab
     - If the location code is valid in the ″Connected-To″ tab, use that location code for the SNI
     - If the location code is not valid in the ″Connected-To″ tab, refer to the cable planning documentation, the cable labels, or trace the cable to determine which SNI is connected to the SPC card port
– Both the SNI and the SPC card do not have a valid location code and the reference code you recorded begins with BB30, or BB40:
  a. The reference code extension you recorded from the Serviceable Event indicates the logical location of the failing SNI port
  b. Use the following reference code positions to convert the extensions:
     - Characters 1 through 5 – reserved, set to 0
     - Character 6 – network
     - Characters 7 through 9 – frame number
     - Characters 10 and 11 – slot number
     - Characters 12 and 13 – reserved
     - Character 14 – card
     - Character 15 – chip
     - Character 16 – port
     - For example, reference code 0000000040512330 yields the location: network 0, frame 004, slot 05, (ignore next two characters), card 3, chip 3, port 0
  c. Go to the HPSNM End Point View on the CSM Management Server
  d. Find the row that matches the location for the frame, slot, chip, and port numbers that you recorded, and click on that row

     Note: On the HPSNM, chip numbers are labeled ″Adapter Number.″
     - If the location code in the GUI is valid, use that location code for the SNI
     - If the location code is not valid:
       1) Click on ″Selected-Properties″
       2) Click on the ″Connected-To″ tab
       3) Get a location for the SPC card:

- If the location code is valid in the ″Connected-To″ tab, this is the SPC card to which the SNI is connected
- If the location code is not valid in the ″Connected-To″ tab, use the following to determine the SPC card to which the SNI is connected:
  a) Record, the frame and slot of this SPC card
  b) That information indicates the switch planar to which the SPC card is connected
  c) The SPC card number (Cx) in the location code should be valid, use that information to find the specific SPC card plugged into the switch planar

4) Using the cable planning documentation, a cable label, or by tracing the switch cable, determine which SNI is connected to this SPC card port

- If the FRU list shows **an SNI but does not show an SPC card**:
  a. The frame and slot you recorded from the Serviceable Event will locate the server CEC with the failing SNI
  b. Use the following reference code positions to convert the extensions:
     – Characters 1 through 5 – reserved, set to 0
     – Character 6 – network
     – Characters 7 through 9 – frame number
     – Characters 10 and 11 – slot number
     – Characters 12 and 13 – reserved
     – Character 14 – card
     – Character 15 – chip
     – Character 16 – port
     – For example, reference code 0000000040512110 yields the location: network 0, frame 004, slot 05, (ignore next two characters), card 1, chip 1, port 0
  c. Open the HPSNM End Point View on the CSM Management Server
  d. Find the row that matches the location for the frame, slot, chip, and port numbers that you recorded, and click on that row

     Note: On the HPSNM, chip numbers are labeled ″Adapter Number.″
  e. Click on ″Selected-Properties″
     – If the location code is valid, use that for the SNI location
     – If the location code is not valid, but you can determine that there is only one SNI in the CEC at the frame and slot location you identified, then that is the location for the failing SNI
     – If the location code is not valid and there is more than one SNI in the CEC at the frame and slot location you identified, call the next level of support

5. Before replacing the SNI, make sure that you have run the appropriate diagnostic procedures
6. Try to verify that there is a flashing LED on the SNI card you are going to service
   - The lack of a flashing LED is not a positive indicator that this is not the correct SNI
7. You can get the part number by looking on the part itself and cross-referencing to the Chapter 11, “Parts catalog,” on page 209

HPSA590: Symbolic FRUs for p5-590 and p5-595 server SNIs

Finding ″HPSA590″ in the FRU ″Part number″ field on the SFP Serviceable Event Details panel, indicates that SFP was not able to resolve the system data for a Switch Network Interface (SNI) in a p5-590 or p5-595 server. A symbolic FRU does not automatically indicate that a component requires service. However, if that FRU does require service, and if you have isolated the cause of the serviceable event to an SNI in a p5-590 or p5-595 server, then you will have to use the procedures in this section to isolate the FRU.

There are two reasons for a Symbolic FRU being displayed instead of a part number:

- VPD is unavailable so the part number is unknown

- The location code for the switch planar is not fully known
  - The ″#″ symbol will be used as a placeholder in the location code (for example: U####.###.#######-P#-C#)

If you have a valid SNI location code
A valid location code does not have any ″#″ characters. If this is the case, look up the part number for a 1-Link SNI in the Chapter 11, “Parts catalog,” on page 209

If you do not have a valid SNI location code
You will need to determine the location and part number for the SNI. The basic steps for determining the FRU information are as follows:

1. Record the available information
2. Determine the server location for the 1-Link SNI
3. If possible, verify that you have the correct FRU
4. Record the SNI part number

If you **do not** have a valid SNI location code:

1. Record the frame and slot information from the Serviceable Event text
2. Record the reference code for the Serviceable Event
3. Record the reference code extension for the Serviceable Event
4. Using the information you recorded from the FRU list, determine which of the following procedures will help you find the server with the failing SNI
   - If the FRU list shows **an SNI and an SPC card** and:
     - The SPC card has a valid location code:
       a. Record, the location of the SPC card with the valid location
       b. Go to the HPSNM Switch Topology View on the CSM Management Server
       c. Find the Switch Port Connection Card location that you recorded and click on it
       d. Click on ″Selected-Properties″
       e. Click on the ″Connected-To″ tab
          - If the location code for the SNI in the ″Connected-To″ tab is valid, use that location code for the SNI.
          - If the location code in the ″Connected-To″ tab is not valid, refer to your cable planning documentation or a cable label to determine which SNI is connected to this SPC card port
     - Both the SNI and the SPC card do not have a valid location code and the reference code you recorded begins with BB10, BB20 or BB50:
       a. The frame and slot information you recorded from the Serviceable Event indicates the location of the switch
       b. The location code characters that indicate the SPC card number (Cx) should be valid
       c. Go to the HPSNM Switch Topology View on the CSM Management Server
       d. Find the Switch Port Connection card location that you recorded and click on it
       e. Click on ″Selected-Properties″
       f. Click on the ″Connected-To″ tab
          - If the location code is valid in the ″Connected-To″ tab, use that location code for the SNI
          - If the location code is not valid in the ″Connected-To″ tab, refer to the cable planning documentation, the cable labels, or trace the cable to determine which SNI is connected to the SPC card port
     - Both the SNI and the SPC card do not have a valid location code and the reference code you recorded begins with BB30, or BB40:
       a. The reference code extension you recorded from the Serviceable Event indicates the logical location of the failing SNI port

b. Use the following reference code positions to convert the extensions:
   - Characters 1 through 5 – reserved, set to 0
   - Character 6 – network
   - Characters 7 through 9 – frame number
   - Characters 10 and 11 – slot number
   - Characters 12 and 13 – reserved
   - Character 14 – card
   - Character 15 – chip
   - Character 16 – port
   - For example, reference code 0000000040512330 yields the location: network 0, frame 004, slot 05, (ignore next two characters), card 3, chip 3, port 0
c. Go to the HPSNM End Point View on the CSM Management Server
d. Find the row that matches the location for the frame, slot, chip, and port numbers that you recorded, and click on that row

   Note: On the HPSNM, chip numbers are labeled ″Adapter Number.″
   - If the location code in the GUI is valid, use that location code for the SNI
   - If the location code is not valid:
     1) Click on ″Selected-Properties″
     2) Click on the ″Connected-To″ tab
     3) Get a location for the SPC card:
        - If the location code is valid in the ″Connected-To″ tab, this is the SPC card to which the SNI is connected
        - If the location code is not valid in the ″Connected-To″ tab, use the following to determine the SPC card to which the SNI is connected:
          a) Record, the frame and slot of this SPC card
          b) That information indicates the switch planar to which the SPC card is connected
          c) The SPC card number (Cx) in the location code should be valid, use that information to find the specific SPC card plugged into the switch planar
     4) Using the cable planning documentation, a cable label, or by tracing the switch cable, determine which SNI is connected to this SPC card port

- If the FRU list shows **an SNI but does not show an SPC card**:
  a. The frame and slot you recorded from the Serviceable Event will locate the server CEC with the failing SNI
  b. Use the following reference code positions to convert the extensions:
     – Characters 1 through 5 – reserved, set to 0
     – Character 6 – network
     – Characters 7 through 9 – frame number
     – Characters 10 and 11 – slot number
     – Characters 12 and 13 – reserved
     – Character 14 – card
     – Character 15 – chip
     – Character 16 – port
     – For example, reference code 0000000040512110 yields the location: network 0, frame 004, slot 05, (ignore next two characters), card 1, chip 1, port 0
  c. Open the HPSNM End Point View on the CSM Management Server
  d. Find the row that matches the location for the frame, slot, chip, and port numbers that you recorded, and click on that row

     Note: On the HPSNM, chip numbers are labeled ″Adapter Number.″
  e. Click on ″Selected-Properties″

- If the location code is valid, use that for the SNI location
- If the location code is not valid, but you can determine that there is only one SNI in the CEC at the frame and slot location you identified, then that is the location for the failing SNI
- If the location code is not valid and there is more than one SNI in the CEC at the frame and slot location you identified, call the next level of support

5. Before replacing the SNI, make sure that you have run the appropriate diagnostic procedures
6. Try to verify that there is a flashing LED on the SNI card you are going to service
   - The lack of a flashing LED is not a positive indicator that this is not the correct SNI
7. You can get the part number by looking on the part itself and cross-referencing to the Chapter 11, "Parts catalog," on page 209

HPSSSW: Symbolic FRUs for HPS planars

Finding ″HPSSSW″ in the FRU ″Part number″ field on the SFP Serviceable Event Details panel, indicates that SFP was not able to resolve the system data for a switch planar. A symbolic FRU does not automatically indicate that a component requires service. However, if that FRU does require service, and if you have isolated the cause of the serviceable event to a switch planar, then you will have to use the procedures in this section to isolate the FRU.

There are two reasons for a Symbolic FRU being displayed instead of a part number:

- VPD is unavailable so the part number is unknown
- The location code for the switch planar is not fully known
  - The ″#″ symbol will be used as a placeholder in the location code (for example: U####.###.#######-P1)

If you have a valid switch planar location code

A valid location code does not have any ″#″ characters. If this is the case, look up the switch planar part number in the Chapter 11, "Parts catalog," on page 209.

If you do not have a valid switch planar location code

You will need to determine the location and part number for the switch planar. The basic steps for determining the FRU information are as follows:

1. Record the available information
2. Determine the location code for the switch planar and verify that you have the correct planar if possible
   - To determine the switch planar location, you will use location codes and connections associated with functioning SPC cards
3. Record the part number for the switch planar

If you **do not** have a valid switch planar location code:

1. Record the frame and slot information from the Serviceable Event text
2. Record the reference code for the Serviceable Event
3. Record the reference code extension for the Serviceable Event
4. Using the information you recorded from the FRU list, determine which of the following procedures will help you find the switch with the failing FRU:
   - If the FRU list shows **two switch planars** and:
     - One of the switch planars has a valid location code:
       a. Find the Switch Port Connection card that corresponds to the switch planar with the valid location code
          - The SPC card will have the same unit location as the switch planar: U7045.SW4.[serial number]
       b. Record, the location of the Switch Port Connection card
       c. Go to the HPSNM Switch Topology View on the CSM Management Server

d. Find the Switch Port Connection card location that you recorded and click on it
e. Click on ″Selected-Properties″
f. Click on the ″Connected-To″ tab
g. Record the frame and slot of the port at the other end of the cable
h. That frame and slot information indicates the location of the failing switch planar

– Both of the switch planars do not have a valid location code and this is the first switch in the FRU list
  - With those conditions, the frame and slot information you recorded from the Serviceable Event indicates the location of the switch
– Both of the switch planars do not have a valid location code and this is the second switch in the FRU list:
  a. The reference code extension that you recorded from the Serviceable Event will indicate the port location on the other switch
  b. Use the following reference code positions to convert the extensions:
     - Characters 1 through 5 – reserved, set to 0
     - Character 6 – network
     - Characters 7 through 9 – frame number
     - Characters 10 and 11 – slot number
     - Characters 12 and 13 – reserved
     - Character 14 – card
     - Character 15 – chip
     - Character 16 – port
     - For example, reference code 0000000040303172 yields the location: network 0, frame 004, slot 03, (ignore next two characters), card 1, chip 7, port 2
  c. Go to the HPSNM Switch Topology View on the CSM Management Server
  d. Find the row that matches the frame, slot, chip, and port numbers that you recorded and click on that row
  e. Click on ″Selected-Properties″
  f. Click on the ″Connected-To″ tab
     - If the location code in the ″Connected-To″ tab is valid, remove the ″-Cx-Ty″ characters from the location code and the resulting location code will be the switch planar
     - If the location code in the ″Connected-To″ tab is not valid:
       1) Record, the frame and slot of the port at the other end of the cable
       2) That frame and slot indicates the location of the switch planar

• If the FRU list shows **one switch planar and one SNI** and:
  – The SNI has a valid location code:
    a. Record the location code for the SNI
    b. Go to the HPSNM End Point View on the CSM Management Server
    c. Find the row that matches the recorded location code for the SNI and click on it
    d. Click on ″Selected-Properties″
    e. Click on the ″Connected-To″ tab
       - If the location code in the ″Connected-To″ tab is valid, remove the ″-Cx-Ty″ characters from the location code and the resulting location code will be the switch planar
       - If the location code in the ″Connected-To″ tab is not valid:
         1) Record, the frame and slot of the port at the other end of the cable
         2) That frame and slot indicates the location of the switch planar
  – The SNI does not have a valid location code:

- If the reference code that you recorded begins with BB10, BB20, or BB50, the frame and slot listed in the Serviceable Event will locate the switch planar
- If the reference code that you recorded begins with BB30 or BB40:
  a. Use the following reference code positions to convert the extensions:
     - Characters 1 through 5 – reserved, set to 0
     - Character 6 – network
     - Characters 7 through 9 – frame number
     - Characters 10 and 11 – slot number
     - Characters 12 and 13 – reserved
     - Character 14 – card
     - Character 15 – chip
     - Character 16 – port
     - For example, reference code 0000000040512330 yields the location: network 0, frame 004, slot 05, (ignore next two characters), card 3, chip 3, port 0
  b. Go to the HPSNM End Point View on the CSM Management Server
  c. Find the row that matches the frame, slot, chip, and port numbers and click on that row
     - Chip numbers are labeled ″Adapter number″ on the GUI
  d. Click on ″Selected-Properties″
  e. Click on the ″Connected-To″ tab
     - If the location code in the ″Connected-To″ tab is valid, remove the ″-Cx-Ty″ characters from the location code and the resulting location code will be the switch planar
     - If the location code in the ″Connected-To″ tab is not valid:
       1) Record, the frame and slot of the port at the other end of the cable
       2) That frame and slot indicates the location of the switch planar

- If the FRU list shows **one switch planar but does not show an SNI**:
  a. The frame and slot listed in the Serviceable Event will locate the switch planar
  b. Double check the planar location by:
     1) Open the HPSNM Switch Topology View
     2) Finding the switch in the frame and slot listed above
     3) Using the GUI, expand the ports to see if there is a valid location code for any of the ports
     4) If there is, you can drop the ″-Cx-Ty″ to get the location code for the switch

5. Before replacing the switch planar, make sure that you have run the appropriate diagnostic procedures
6. If an SPC card is on the FRU list, try to verify that there is a flashing LED on the SPC card in the same enclosure as the switch planar that you are going to service
   - The lack of a flashing LED is not a positive indicator that this is not the correct switch.
7. You can get the part number by looking on the part itself and cross-referencing to the Chapter 11, “Parts catalog,” on page 209

Recovering a failed ELA Master HMC

If the system experiences:

- An HMC failure
- A connectivity failure between the CSM Management Server and an HMC

You will need to determine if that HMC was used as either the ELA Master HMC or ELA Backup Master HMC.

To determine if the failed HMC was either the ELA Master or ELA Backup:

1. Open the HPSNM GUI on the CSM Management Server
2. Click, ″Select HPSNM ELA Master HMC″
3. Check the fields for ″Last Selected Master″ and ″Last Selected Backup″

4. If:
   - The failed HMC or the HMC with the failed connection **does not** match either the ″Last Selected Master″ or the ″Last Selected Backup″
     a. No recovery action required
     b. Click ″Cancel″ and exit the panel

     Note: If the system only has one HMC or an ELA Master Backup was not configured, the fields for ″Last Selected Backup″ and ″Current ELA Backup″ HMC should display ″None.″
   - The failed HMC or the HMC with the failed connection matches either the ″Last Selected Master″ or the ″Last Selected Backup,″ then you will need to take the following recovery actions:
     a. From the main GUI panel, click ″Current ELA Master″
     b. After you identify the current Master HMC, select another HMC for the master backup
     c. Return to the main GUI panel and click, ″Current ELA Backup″
     d. Enter the ID for the new backup HMC and close the panel

Repair verification

The information in this section applies to switch network FRUs. This includes:
- Switch cables
- Switch Port Connection cards (SPC cards)
- Switch planars
- Switch Network Interfaces (SNIs)

Repair verification overview

Under some conditions, the network information in Service Focal Point may not be complete. These conditions exist when the switch network has a broken link *and* you have either replaced a FRU or you are restarting HPSNM. When the network has a broken link, FRU and network information cannot be exchanged across that link. After the link ″times″ at least once, the system will detect a problem but the missing information prevents the system from fully isolating the problem.

The following examples illustrate possible outcomes of missing information:
- In the case of a broken link between a Switch Port Connection (SPC) card and an SNI, the SNI *may or may not* report the problem to SFP. In addition, the SPC card *will not* be able to report information to SFP. If you are only using the information in SFP, you may end up replacing the SNI when the fault could be on the SPC card.
- In the case of a broken link across a switch-to-switch connection, both sides will report a problem to SFP. However, you will not know which switch has the faulty card.
- The ″Connected To″ properties on the HPSNM GUI does not show a connection where one should exist.

Before you begin:
Since you cannot be certain that the information in SFP has fully isolated a problem, all FRU repairs must be manually verified using the procedures in this section. Before you start the verification procedure, compare the FRU list in SFP to the FRU list associated with the error code that initiated the service call. If the FRU list given for the problem by SFP is shorter that the FRU listing given in the error code description, check for the following in the order listed:
1. Loose connections
2. Missing connections
3. Connections other than those stated in the wiring diagram for the recorded topology (miswires)

Repair verification procedures

Note: You only need to perform the verification procedures that apply to the repair action you just completed.

Because the information in Service Focal Point may not be complete, you must verify repairs to the switch network. Verification procedures This section describes verification procedures for the following repairs:

- “Cable repair verification”
- “Switch Port Connection card repair verification”
- “Switch planar repair verification” on page 199
- “SNI repair verification” on page 200
- “Link repair verification” on page 200

Cable repair verification

After replacing a switch cable, use this procedure to test both ends of the connection and verify the availability of the link:

1. Note the current time

   Note: Later, you will use the recorded time to determine if Service Focal Point has been able to refresh the network information.
2. Check the green LEDs on both ends of the cable:
   - If both LEDs are steady and green, proceed with step 3
   - If either one or both of the LEDs are either flashing or off, reseat the cable and recheck the LEDs
     a. If you cannot get the green LEDs to stay on solidly, rerun diagnostics on that link
     b. If the diagnostics do not specify any FRUs for replacement, replace the newly added cable and repeat step 2 until both of the cable end LEDs are steady and green
     c. When both LEDs are solid green, note the time
3. Perform the procedure for “Link repair verification” on page 200 on both ends of the link
4. Check the HPSNM GUI at both ends of the link to determine if it is has the status of ″Up:Operational″
   - If the link shows a status of ″Up:Operational, go to step 5
   - If the link is not operational:
     a. Refer to Table 54 on page 271 and complete the specified repair action for the network fault reported on HPSNM
     b. If necessary, refer to “Faulty port diagnostics” on page 178 and complete those procedures to determine if other switch components are failing
5. When five minutes have elapsed since the time noted for the solid green LEDs, check Service Focal Point:
   - If there are no new events, return to “End of call procedures (MAP 0650)” on page 140
   - If there are new serviceable events associated with this link, go to “Starting a service call (MAP 0100)” on page 125

Switch Port Connection card repair verification

After replacing a switch port connection (SPC) card, use this procedure to test both ports on the SPC card and verify the availability of the links for that card:

1. Note the current time

   Note: Later, you will use the recorded time to determine if Service Focal Point has been able to refresh the network information.
2. Check the green LEDs on both ports on the SPC card and the green LEDs on the far end of the cables:
   - If the LEDs for both SPC ports and on both of the far ends of each cable are steady and green, proceed with step 3

- If any of the port or cable LEDs are either flashing or off, reseat both ends of the associated cable and recheck the LEDs
  a. If you cannot get the green LEDs to stay on solidly, rerun diagnostics on the associated link
  b. If the diagnostics do not specify any FRUs for replacement, replace the new SPC card and repeat step 2 until the green LEDs at both ends of the cables are steady and green
  c. When all of the LEDs are solid green, note the time
3. Perform the procedure for “Link repair verification” on page 200 on both ends of each link
4. Check the HPSNM GUI at both ends of the link to determine if it is has the status of ″Up:Operational″
   - If the link shows a status of ″Up:Operational, go to step 5
   - If the link is not operational, refer to Table 54 on page 271 and complete the specified repair action for the network fault reported on HPSNM
5. When five minutes have elapsed since the time noted for the solid green LEDs, check Service Focal Point:
   - If there are no new events, return to “End of call procedures (MAP 0650)” on page 140
   - If there are new serviceable events associated with this link, go to “Starting a service call (MAP 0100)” on page 125
6. “End of call procedures (MAP 0650)” on page 140

Switch planar repair verification

After replacing a switch planar, use this procedure to test the new switch and verify the availability of the links for that switch:

1. Note the current time

   Note: Later, you will use the recorded time to determine if Service Focal Point has been able to refresh the network information.
2. At all the ports with switch cables attached to the new switch, check the green LEDs on the SPC cards. In addition, check the green LEDs on the far end of each cable:
   - If all the green LEDs on all SPC cards and on the far ends of each cable are steady and green, proceed with step 3
   - If any of the port or cable LEDs are either flashing or off, reseat both ends of the associated cable and recheck the LEDs
     a. If you cannot get the green LEDs to stay on solidly, rerun diagnostics on the associated links
        – If the diagnostics do not specify any FRUs for replacement, call the next level of support
     b. Complete any service action specified by the diagnostics and repeat step 2 until all LEDs are steady and green
        – When all LEDs are solid green, note the time
3. Run the ″Verify Link″ diagnostic on the new switch
   a. Open the ″Switch Topology View″ panel in the HPSNM GUI
   b. Select the new switch
   c. Choose ″Selected″ → ″Diagnostics″ → ″Verify Link″
   d. Complete any service actions specified by the diagnostics otherwise continue at step 4
4. Return to the ″Switch Topology View″ and verify that all ports on the new switch have the status of ″Up:Operational″
   - If the link shows a status of ″Up:Operational, go to step 5
   - If the link is not operational, refer to Table 54 on page 271 and complete the specified repair action for the network fault reported on HPSNM
5. When five minutes have elapsed since the time noted for the solid green LEDs, check Service Focal Point:
   - If there are no new events, return to “End of call procedures (MAP 0650)” on page 140
   - If there are new serviceable events associated with this link, go to “Starting a service call (MAP 0100)” on page 125
6. “End of call procedures (MAP 0650)” on page 140

SNI repair verification

After replacing a SNI card, use this procedure to test both ports on the SNI card and verify the availability of the links for that card:

1. Note the current time

   Note: Later, you will use the recorded time to determine if Service Focal Point has been able to refresh the network information.
2. Check the green LEDs on all ports on the SNI that have cables attached and the green LEDs on the far end of each of those cables:
   - If the LEDs for all SNI ports and on both of the far ends of each cable are steady and green, proceed with step 3
   - If any of the port or cable LEDs are either flashing or off, reseat both ends of the associated cable and recheck the LEDs
     a. If you cannot get the green LEDs to stay on solidly, rerun diagnostics on the associated link
     b. If the diagnostics do not specify any FRUs for replacement, replace the new SNI and repeat step 2 until all LEDs are steady and green
     c. When all of the LEDs are solid green, note the time
3. Perform the procedure for "Link repair verification" on both ends of each link
4. Check the HPSNM GUI at both ends of the link to determine if it is has the status of ″Up:Operational″
   - If the link shows a status of ″Up:Operational, go to step 5
   - If the link is not operational, refer to Table 54 on page 271 and complete the specified repair action for the network fault reported on HPSNM
5. When five minutes have elapsed since the time noted for the solid green LEDs, check Service Focal Point:
   - If there are no new events, return to "End of call procedures (MAP 0650)" on page 140
   - If there are new serviceable events associated with this link, go to "Starting a service call (MAP 0100)" on page 125
6. "End of call procedures (MAP 0650)" on page 140

Link repair verification

Depending on the type of link, use the appropriate procedure to verify a link while a cable is attached.

If the link you are verifying is a switch-to-switch connection:

Use the following procedure to test the ports on both SPC cards for the associated switch cable:

1. Open the ″Switch Topology View″ panel in HPSNM
2. For the cable connecting the two SPC cards associated with the link you are verifying:
   a. Select the appropriate port on one of the SPC cards
   b. On the menu bar, click: ″Selected″ → ″Diagnostics″ → ″Verify Link″
   c. If the selected port passes the verification test, repeat the test for the port on the opposite end of the cable
3. If either side of the link fails the previous test:
   a. Replace the switch cable
   b. Restart the verification test at step 2
4. Return to the repair verification procedure that directed you here

If the links you are verifying is a server-to-switch connection:

Use the following procedure to test the ports on both the SPC card and the SNI for the switch cable associated with the link:

1. Test the port on the SNI side of the cable:
   a. Open the ″End-point View″ panel in HPSNM
   b. Select the appropriate port on the SNI
   c. On the menu bar, click: ″Selected″ → ″Diagnostics″ → ″Verify Link″
   d. If the selected port:

- Passes verification, continue with step 2 and test the port on the switch port connection (SPC) card side of the cable
- Does not pass verification, replace the cable and restart verification at step 1

2. Test the port on the SPC card side of the cable:
   a. Open the ″Switch Topology View″ panel in HPSNM
   b. Select the appropriate port on the SPC card
   c. On the menu bar, click: ″Selected″ → ″Diagnostics″ → ″Verify Link″
   d. If the selected port:
      - Passes verification, return to the repair verification procedure that directed you here
      - Does not pass verification, replace the cable and restart verification at step 2

Service inspection guide

You must perform a service inspection on the system when:

- You inspect the system for a maintenance agreement
- Service is requested and service has not recently been performed
- You perform an alterations and attachments review
- Changes have been made to the equipment that may affect its safe operation
- Power cables for an external devices are attached to the device

If the inspection indicates an unacceptable safety condition, the condition must be corrected before anyone can service the machine.

Note: The owner of the system is responsible to correct any unsafe conditions.

During a service inspection, perform the following checks:

1. Check the covers for sharp edges and for damage or alterations that expose the internal parts of the system
2. Check the covers for proper fit to the rack; covers should be in place and secure
3. Gently rock the rack from side to side to verify the rack is stable
4. Turn off the UEPO switch, turn off the circuit breakers on all optional IBF subsystems (if provided), then disconnect both power cords from the receptacle
5. Remove the covers
6. Check for alterations or attachments and if there are any, check for obvious safety hazards such as: broken wires, sharp edges, or broken insulation
7. Check the internal cables for damage
8. Check for dirt, water, and any other contamination within the system
9. If the rack has a processor subsystem, check the air filters to make certain they are clean and replace if necessary
10. Check the voltage label on the back of the system to ensure that it matches the voltage at the outlet
11. Check the external power cable for damage
12. Perform the following checks on each device that has its own power cables:
    a. Check for damage to the power cord
    b. Check for the correct grounded power cable
    c. With the external power cable connected to the device, check for 0.1 ohm or less resistance between the ground lug on the external power cable plug and the metal frame of the device
13. Reinstall the covers

Chapter 10. FRU removal and replacement procedures

This chapter describes the removal and replacement of HPS Field Replaceable Unit (FRU) components.

Attention: Some switch components are susceptible to damage from static discharge. Always use an ESD wristband when working inside frame covers. (See "Personal ESD requirements" on page 152 for more details.) Do not touch the pins or circuitry on these components.

Handling static-sensitive devices

Attention: Adapters, planars, disk drives, supervisor cards and memory cards are sensitive to static electricity discharge. These devices are wrapped in antistatic bags or containers to prevent this damage.

Perform the following procedures to prevent damage to these devices:
1. Do not remove the device from the antistatic bag or container until you are ready to install the device in the system unit.
2. You must wear an ESD wristband while installing or removing any static-sensitive devices.
3. With the device still in its antistatic bag, touch it to a metal frame of the system.
4. Grasp cards and boards by the edges. Hold drives by the frame. Avoid touching the solder joints and pins.
5. Handle the devices carefully in order to prevent permanent damage.

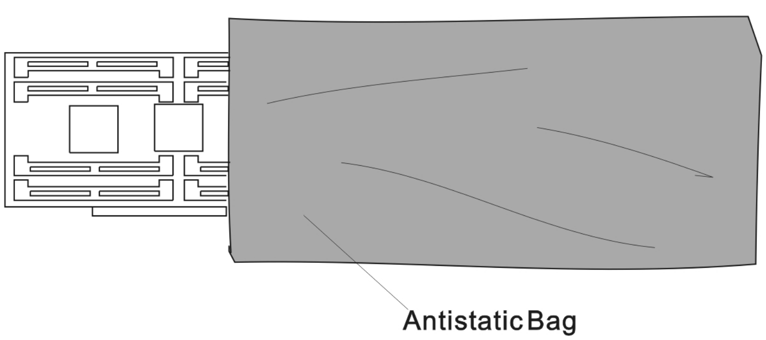


Figure 42. Handling an anti-static device

HPS service procedures

This section describes removal and replacement procedures for the following HPS FRUs:
- Switch planar assembly
- Switch Port Connection cards

Note: For DCA, UPIC, and fan procedures, refer to the Repair and Verify procedures in Service Focal Point.

Remove and replace switch planars

Removing the switch planar

Attention: Removal of the switch planar involves the removal of the switch's externally accessible plug-in assemblies.

Note: Refer to "Handling static-sensitive devices" on page 203.

1. Power off the switch
   - This procedure requires three sequential actions: collect MTMS information, power off the switch planar, and then power off the frame BPA
   a. Collect MTMS information:
      1) Open the FRU list in Service Focal Point
      2) From the FRU list, record the location code of the switch planar
      3) On the FRU list, double click the switch planar FRU and note the MTMS for the power controlling enclosure (switch BPA)
         - If the power controlling enclosure is not available, go to the frame that contains the switch and record the MTMS of the BPA
         - If the switch is in a switch-only expansion frame, use the MTMS for the BPA in the primary frame
   b. Power off the switch planar:
      1) Open HPSNM on the CSM Management Server
      2) Open the ″Switch Topology View″ panel
      3) Using the location code you previously recorded, select the switch requiring service
      4) On the ″Topology″ toolbar, click ″Select″ → ″Power″ → ″Off″
   c. Power off the frame BPA:
      1) Go to the HMC controlling the switch
      2) Open the Service Applications folder
      3) Open Service Focal Point
      4) Select ″Exchange Parts″
      5) When the ″Exchange Parts″ window opens, select ″System Unit Bulk Power Assembly″
         - Make certain that the MTMS matches the information you recorded for the power controlling enclosure (frame BPA)
      6) From the menu in the ″Exchange Parts″ window click ″Selected-Replace FRU″
      7) This opens the ″Replace Hardware - Replace FRU, Select FRU Type″ window
         - This window has two panels: the ″Install Enclosures″ panel and the ″Description″ panel
      8) When the ″Replace Hardware - Replace FRU, Select FRU Type″ window opens, click ″Installed Enclosure Types″
      9) Select the switch to be replaced from the pull down list
         - Selecting the switch in the ″Install Enclosures″ panel fills in the switch information in the ″Description″ panel
      10) In the ″Description″ panel, click ″Power OFF the entire unit″
2. Remove **all** installed SPC cards and blanks
   - Refer to "Removing a Switch Port Connection card" on page 206
3. Unplug both switch fan power cables from the DCAs
4. Remove **both** DCAs
   - Refer to the Repair and Verify procedure for removing a DCA power supply
5. If the switch is mounted:
   - In the first (bottom) frame slot:
     a. At the front of the frame, remove the switch chassis mounting screws from the EIA rails
     b. Place the coated, foam service block (shipped with the replacement planar) on the floor and up against the front of the frame
     c. Slide the switch chassis out the front of the frame and onto the block

- In the second frame slot or above:
  a. At the rear of the frame, as needed, move any cabling behind the switch to facilitate the removal of the planar
6. At the rear of the switch chassis, loosen the captive mounting screws securing the planar to the chassis
7. Lift up on the rear of the planar and slide the planar out of the chassis

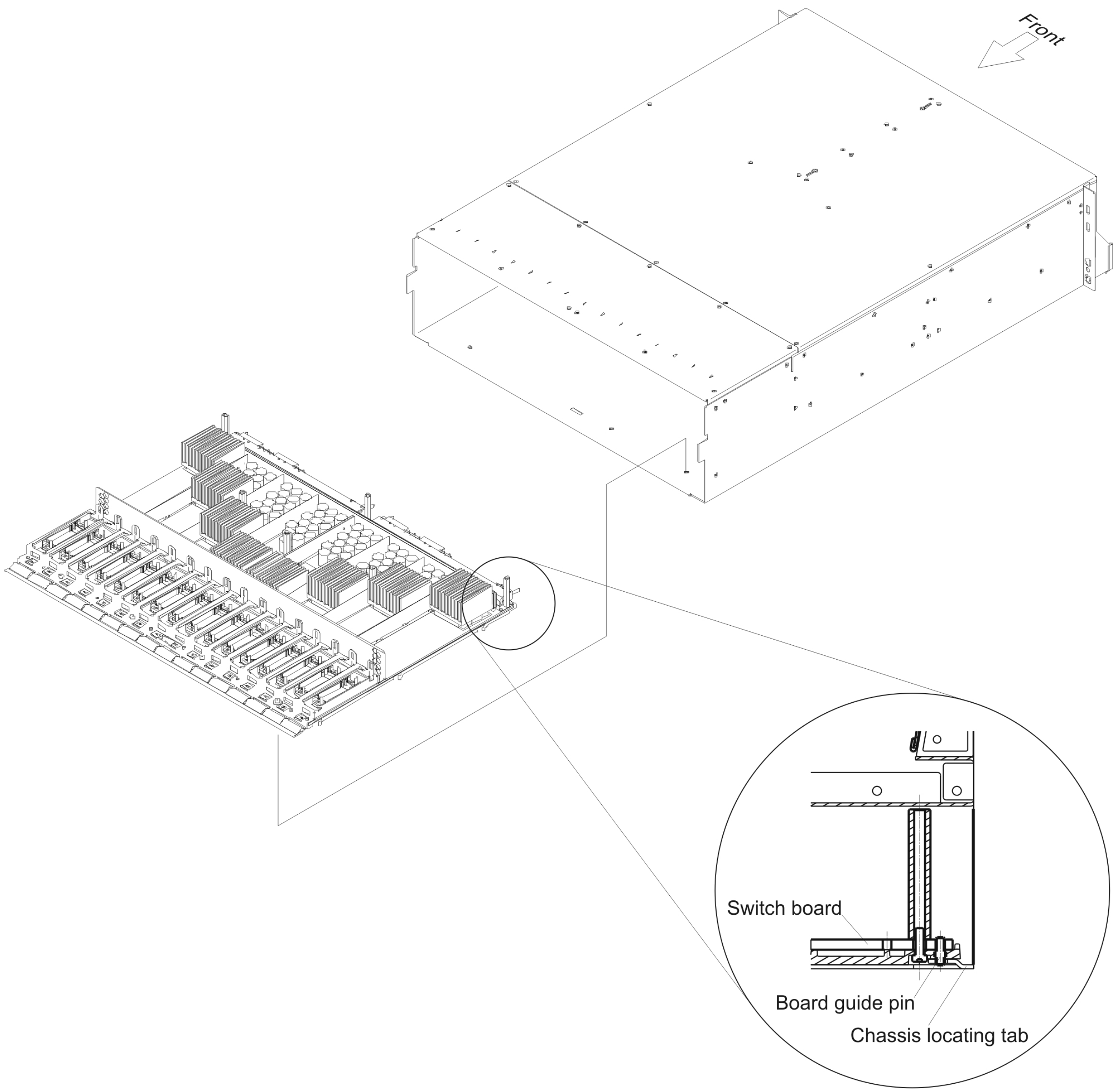


Figure 43. Removing HPS planar assembly

Replacing the switch planar

Attention: Replacement of the switch planar involves the replacement of the removed switch's externally accessible plug-in assemblies into the new switch planar.

1. Holding the rear of the switch planar slightly raised, slide the planar into the switch chassis until the planar retention clips are engaged

2. Place the rear of the planar onto the chassis and secure the captive mounting screws to the chassis
3. If the switch is mounted:
   - In the second frame slot or above, go to step 4
   - In the first (bottom) frame slot:
     a. Slide the switch chassis off the foam service block and into the front of the frame
     b. Install the switch chassis mounting screws to the EIA rails
4. Reinstall **both** DCAs
   - Refer to the Repair and Verify procedure for replacing a DCA power supply
5. Reconnect both switch fan power cables to their DCA's
6. Reinstall **all** SPC cards and blanks
   - Refer to "Replacing a Switch Port Connection card" on page 208
7. Power on the switch
   - Powering on the switch requires two sequential actions that are detailed below: activating power to the switch DCA and then power on the switch planar

   a. Activating power to the switch DCA:
      1) Go to the HMC controlling the switch
      2) Open the Service Applications folder
      3) Open Service Focal Point
      4) Select ″Exchange Parts″
      5) When the ″Exchange Parts″ window opens, select ″System Unit Bulk Power Assembly″
         - Make certain that the MTMS matches the information you recorded for the power controlling enclosure (frame BPA)
      6) From the menu in the ″Exchange Parts″ window click ″Selected-Replace FRU″
      7) This opens the ″Replace Hardware - Replace FRU, Select FRU Type″ window
         - This window has two panels: the ″Install Enclosures″ panel and the ″Description″ panel
      8) When the ″Replace Hardware - Replace FRU, Select FRU Type″ window opens, click ″Installed Enclosure Types″
      9) Select the switch that required service from the pull down list
         - Selecting the switch in the ″Install Enclosures″ panel fills in the switch information in the ″Description″ panel
      10) In the ″Description″ panel, click ″Power On the entire unit″

   b. Power on the switch planar:
      1) Open HPSNM on the CSM Management Server
      2) Open the ″Switch Topology View″ panel
      3) Select the switch that required service
      4) On the ″Topology″ toolbar, click ″Select″ → ″Power″ → ″On″
8. Return to the procedure that directed you here

Remove and replace Switch Port Connection cards

Removing a Switch Port Connection card

Note: Refer to "Handling static-sensitive devices" on page 203.

The following information applies to switch port connection (riser) cards:
- Switch Port Connection (SPC) card assemblies are hot-pluggable
- Blank cards required for all unused switch slots
- Port covers are required for EMC compliance on all unused ports on copper cable SPC cards
- Switch Port Connection cards are illustrated in Figure 44 on page 207

Removal procedure

1. Activate the SPC card LED to locate the FRU (refer to "FRU identification LEDs" on page 170)
2. If the SPC card has switch cables, label the port location on any cables that you will be removing

3. Remove cables from the SPC card
4. Label and record the position of any SPC cards that you will be removing
5. Using the torque tool, loosen the captive screw holding the card to the switch chassis
6. Remove the SPC card from its slot by pulling outward

CAUTION:
Energy hazard present. Shorting may result in system outage and possible physical injury. Remove all metallic jewelry before servicing. (C001)

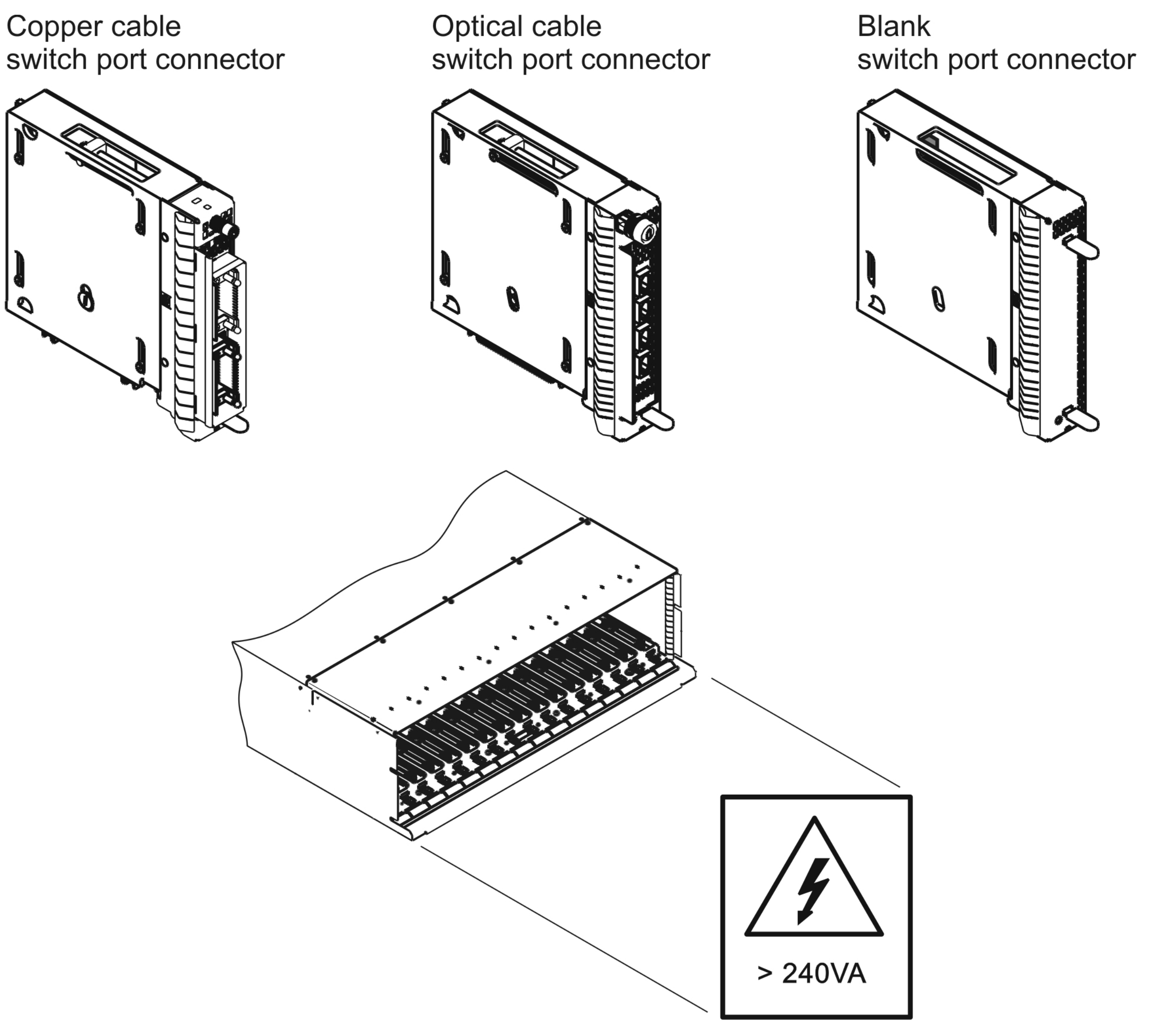


Figure 44. Switch Port Connection cards

CAUTION:
High energy present.

(L005)

Replacing a Switch Port Connection card

The following information applies to switch port connection (riser) cards:
- Switch Port Connection (SPC) card assemblies are hot-pluggable
- Before replacing, check the position label of each card and its associated I/O cables
- Blank cards required for all unused switch slots
- Port covers are required for EMC compliance on all unused ports on copper cable SPC cards
- Switch Port Connection cards are illustrated in Figure 44 on page 207

1. Deactivate the SPC card location LED (refer to “FRU identification LEDs” on page 170)
2. Insert the SPC card into the switch slot
3. Push the card completely into the slot
4. Seat the SPC card by using the torque tool to tighten the captive screw
5. If this card had attached switch cables, reconnect the I/O cables
6. Return to the procedure that directed you here

Chapter 11. Parts catalog

HPS labels and connectors

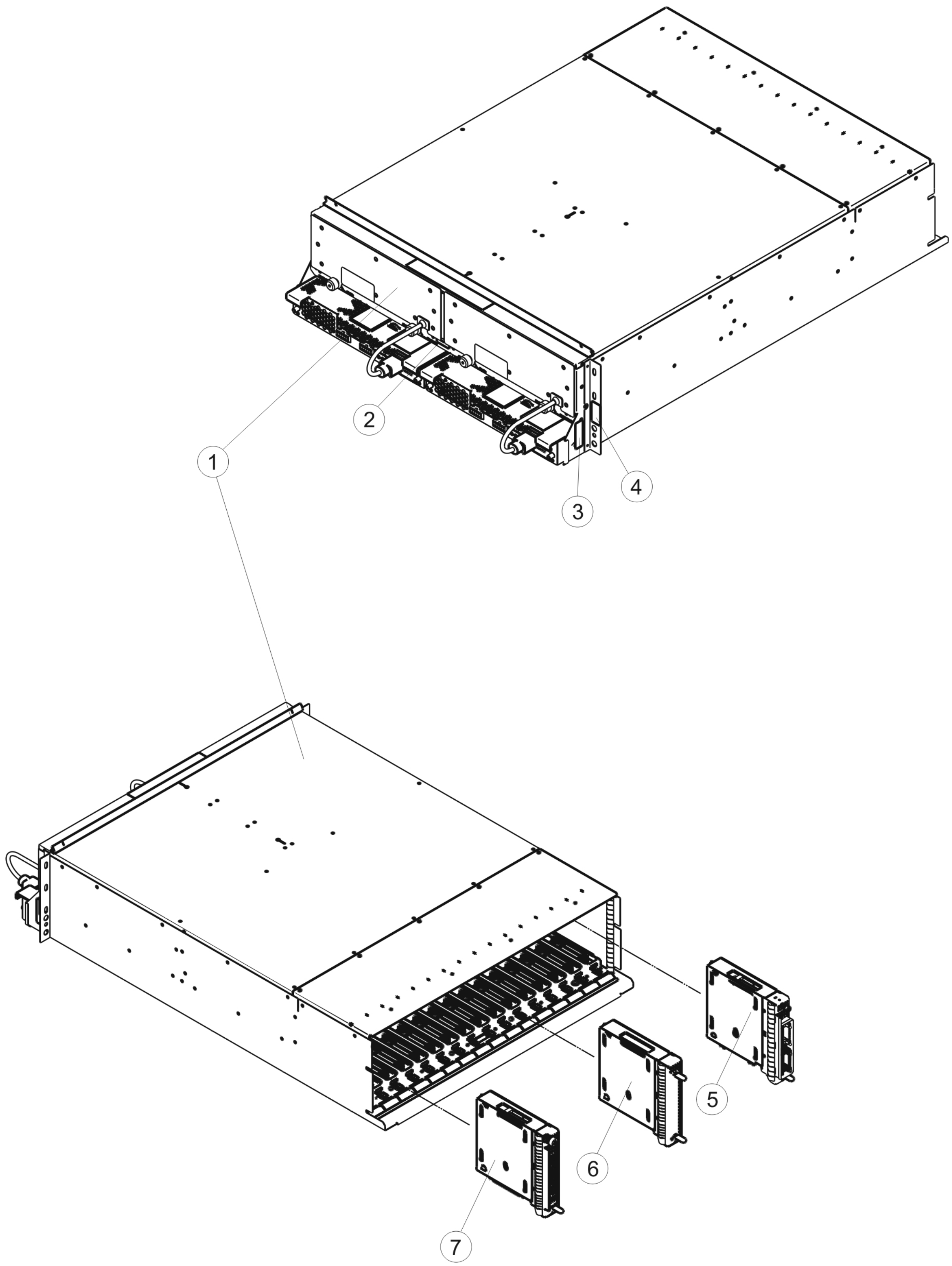


Table 39. HPS labels and switch port connections

Assembly index	Part number	Units	Description
1		1	HPS assembly
2	12K0085	1	Label, blank
3	11J4643	1	Label, machine serial number
4	11P0664	1	Label, configuration
5	12R7567	AR	Switch Port Connection card, copper cable (LDC)
	97P2644	AR	Port cover, for LDC Switch Port Connection cards • Required for EMC compliance
6	44P4606	AR	Switch Port Connection card, blank filler
7	12R7570	AR	Switch Port Connection card, optical cable
	60G7551	AR	Switch cable, copper 1.2 m
	16R0219	AR	Switch cable, copper 3 m
	16R0575	AR	Switch cable, copper 10 m
	12R9079	AR	Switch cable, fiber optic 3.5 m
	16R1653	AR	Switch cable, fiber optic 10 m
	00P3792	AR	Switch cable, fiber optic 20 m
	16R1654	AR	Switch cable, fiber optic 30 m
	00P3793	AR	Switch cable, fiber optic 40 m
	44P4060	1	Service tool kit (part of ship group) • Wrap cable, copper • Wrap cable, fiber optic • Wrap, Switch Port Connection card • Wrap, plug
	16R1505	1	Torque tool

HPS components

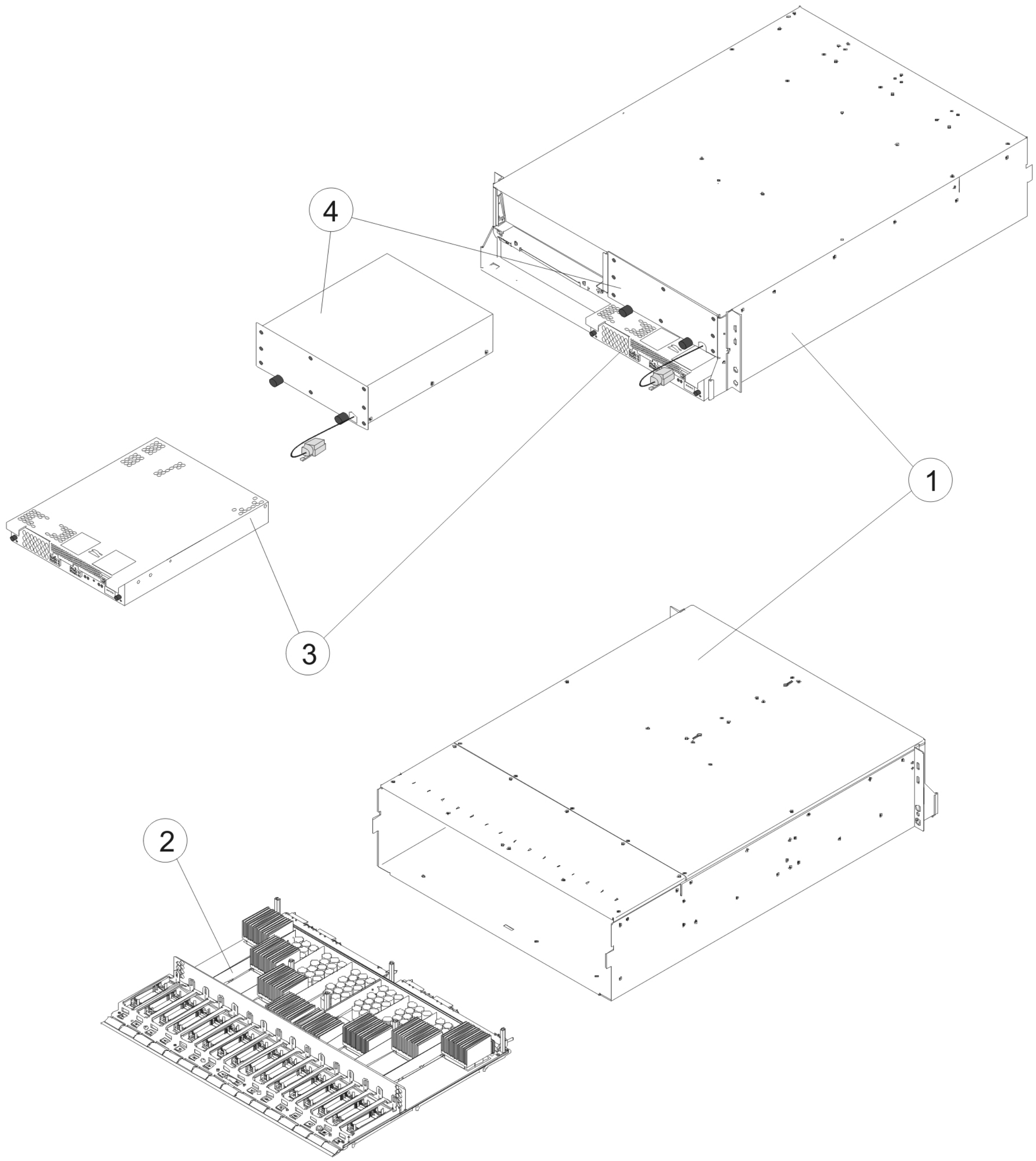
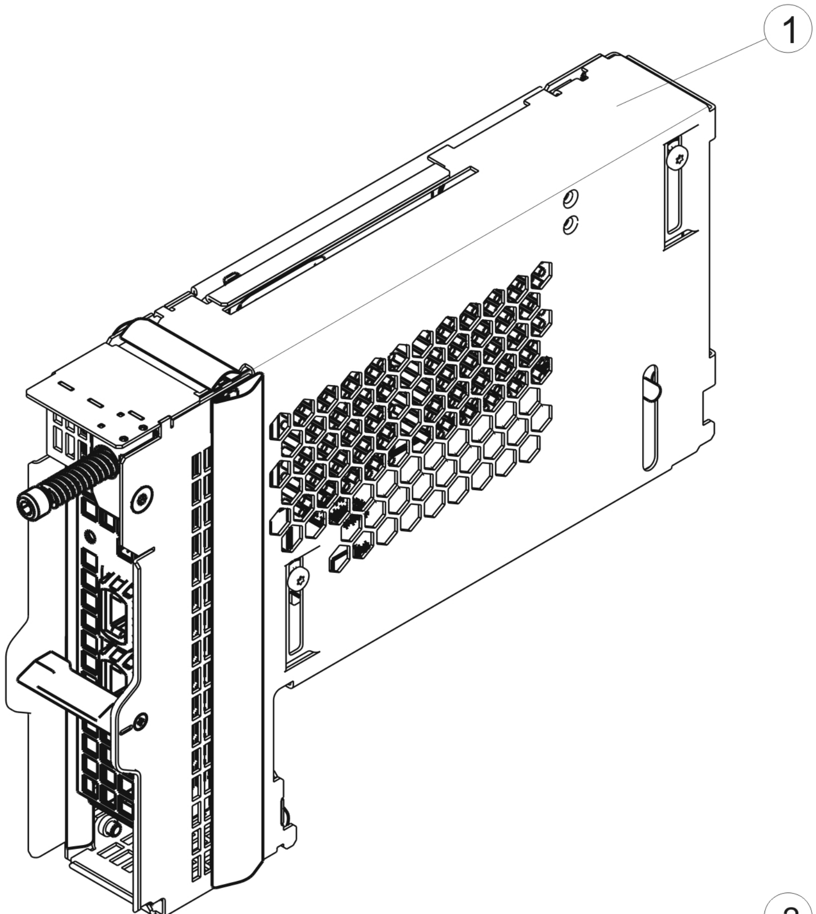


Table 40. HPS components

Assembly index	Part number	Units	Description
1	NA	1	HPS chassis assembly
2	12R6852	1	HPS planar board assembly
3	44P2286	2	DCA-F (power supply) assembly
4	11P3265	2	MSA-FE (fan) assembly

HPS Switch Network Interfaces



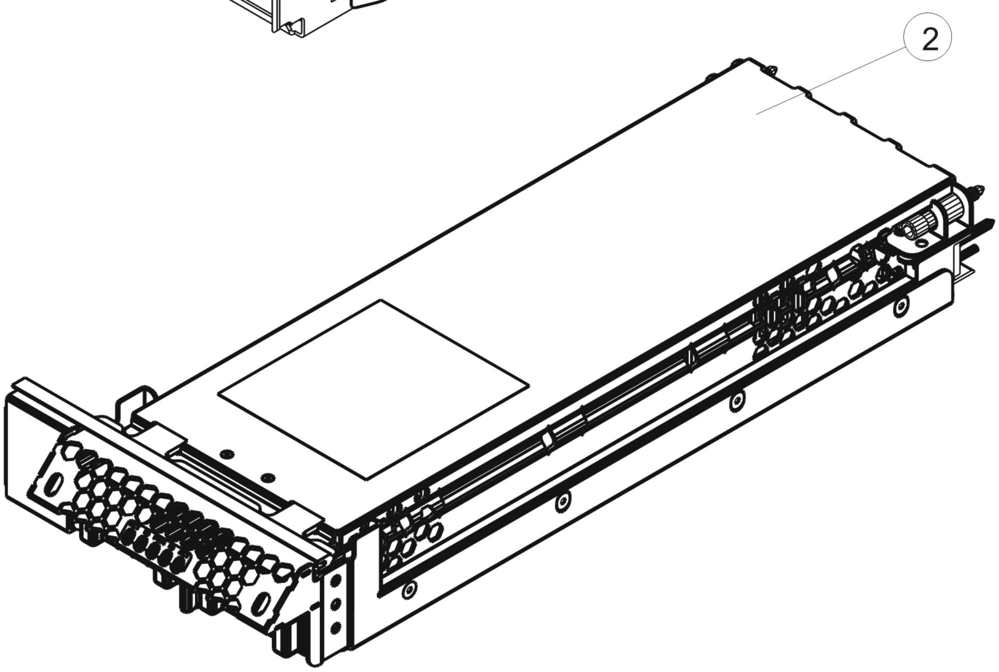


Table 41. HPS Switch Network Interfaces

Assembly index	Part number	Units	Description
1	12R7780	AR	1-Link SNI • Fiber optic cable • **FC 7817** • p5-590 and p5-595servers
2	12R8766	AR	2-Link SNI • Copper cable • **FC 7910** • p5-575 servers

Frame covers for standard switch-only frames

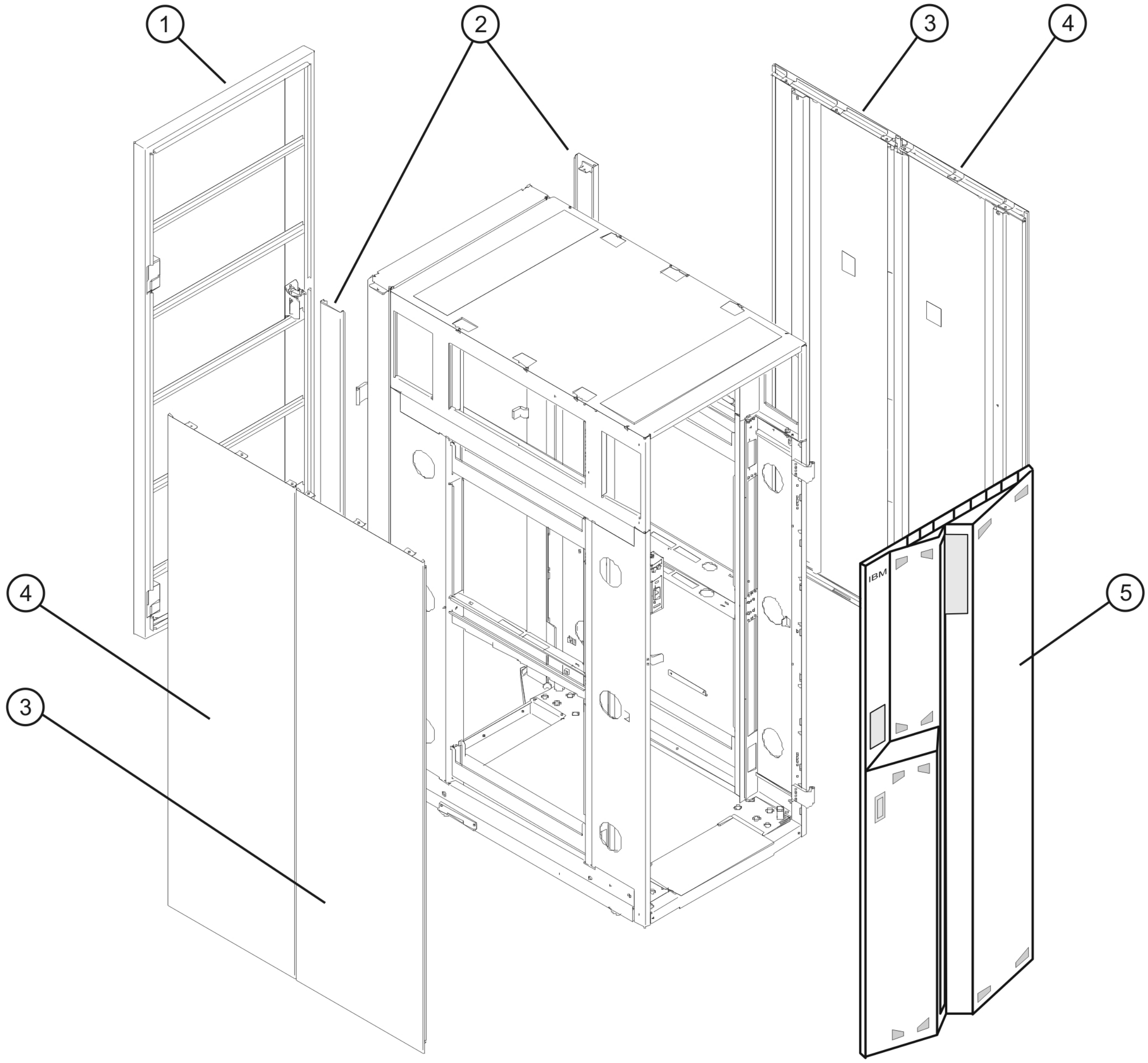


Table 42. Frame covers for standard switch-only frames

Assembly index	Part number	Units	Description
		1	Switch-only frame assembly, standard
1	44P2324	1	Cover, rear
2	44P2819	2	Cover, extender
3	12R6858	2	Cover, right
4	44P0125	2	Cover, left
5	44P2325	1	Cover, front

Frame components (8 inch extenders) and cable management brackets for standard frames

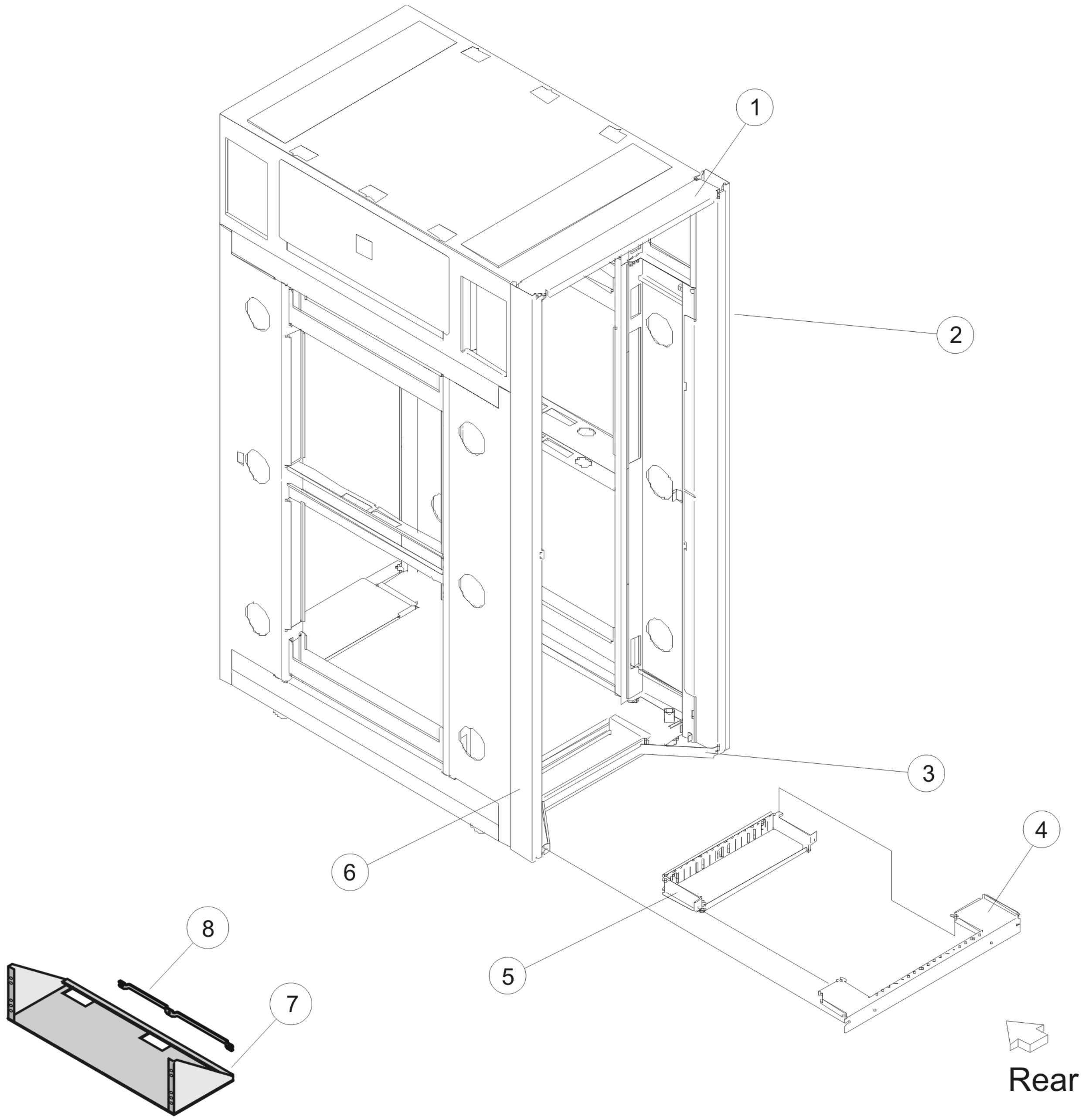


Table 43. Cable management bracket and 8 inch frame extenders for the standard switch-only frames

Assembly index	Part number	Units	Description
		1	Switch-only frame assembly, standard
1	44P2244	1	Extender, top
2	44P2817	1	Extender, right
3	44P1352	1	Stiffener
4	44P3030	1	Extender, bottom
5	44P4028	1	Tailgate (cable management bracket)
6	44P2818	1	Extender, left
7	44P2680	AR	Shelf, node
8	16R1164	AR	Bracket, cable retainer

Note: If the 24 inch powered expansion rack FC 5792/8691 frame is a standard server frame configured with an expansion frame, an additional EMC skirt set must be installed on the expansion frame.

EMC skirts for standard switch-only frames

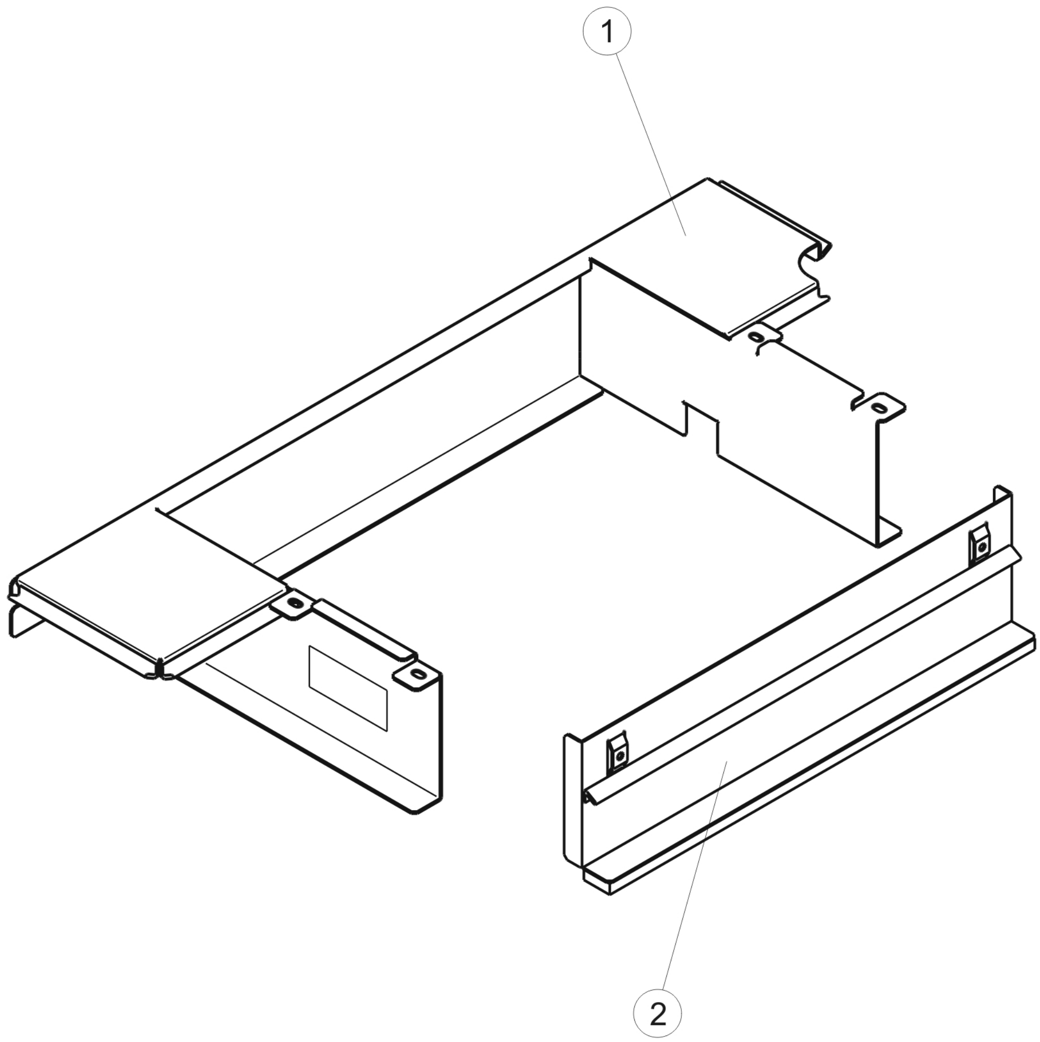


Table 44. EMC skirt for standard HPS switch-only frames

Assembly index	Part number	Units	Description
1	60G7606	1	Kit, EMC skirt
1	44P4101 • 2665525	1 • 6	EMC skirt, front • screw, self tapping M5 hex flange (yellow)
2	44P1844 • 77G0599	1 • 2	EMC skirt, rear • screw, M5 hex flange (black)

Frame extender (24 inch), EMC skirts, and cable retainers

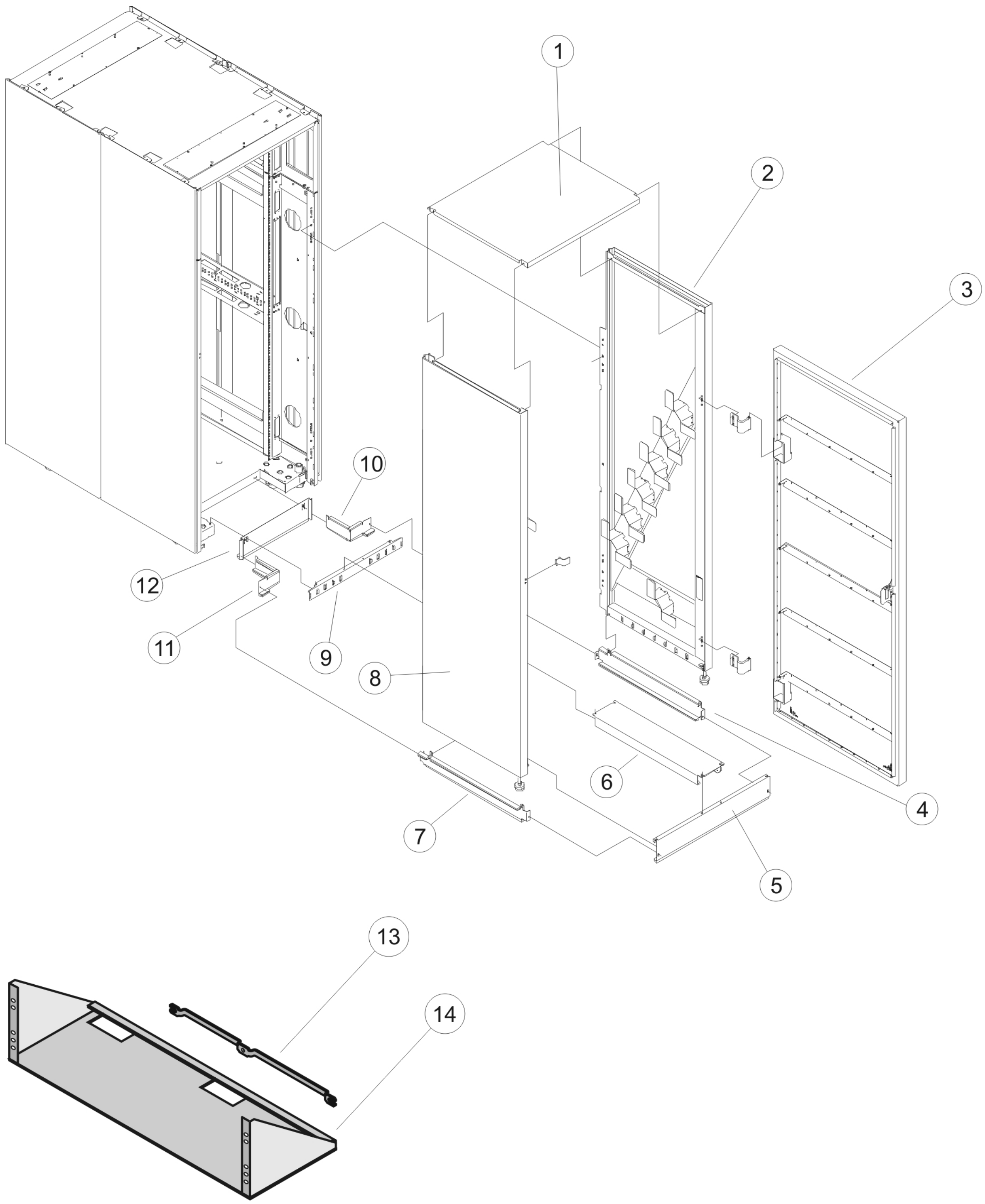


Table 45. 24 inch frame extender, EMC skirts, and cable retainer

Assembly index	Part number	Units	Description
		1	Frame (24 inch powered expansion rack FC 5792/8691) assembly
	44P4378	1	Kit, frame extender
1	44P4373	1	Frame extender, top (included in PN 44P4378)
2	44P4376	1	Frame extender, right side (included in PN 44P4378)
3		1	Existing rear cover and hinges (included in PN 44P4378)
4	44P3820	1	Skirt, right side (EMC, included in PN 44P4378)
5	44P3821	1	Skirt, front (EMC, included in PN 44P4378)
6	44P4828	1	Frame extender, bottom (included in PN 44P4378)
7	44P3819	1	Skirt, left side (EMC, included in PN 44P4378)
8	44P4377	1	Frame extender, left side (included in PN 44P4378)
9	60G7555	1	Retainer, cable (included in PN 44P4378)
10	44P3818	1	Skirt, right corner (EMC, included in PN 44P4378)
11	44P3817	1	Skirt, left corner (EMC, included in PN 44P4378)
12	44P1844	1	Skirt, back (EMC, included in PN 44P4378)
13	16R1164	AR	Bracket, cable retainer
14	44P2680	AR	Shelf, node
	16R0921	1	Kit, EMC gaskets for 24 inch powered expansion rack FC 5792/8691 server frames and switch-only frames with acoustic covers
Note: If the 24 inch powered expansion rack FC 5792/8691 frame assembly is server frame configured with an expansion frame, an additional EMC skirt set must be installed on the expansion frame.			

HPS frame rails and brackets

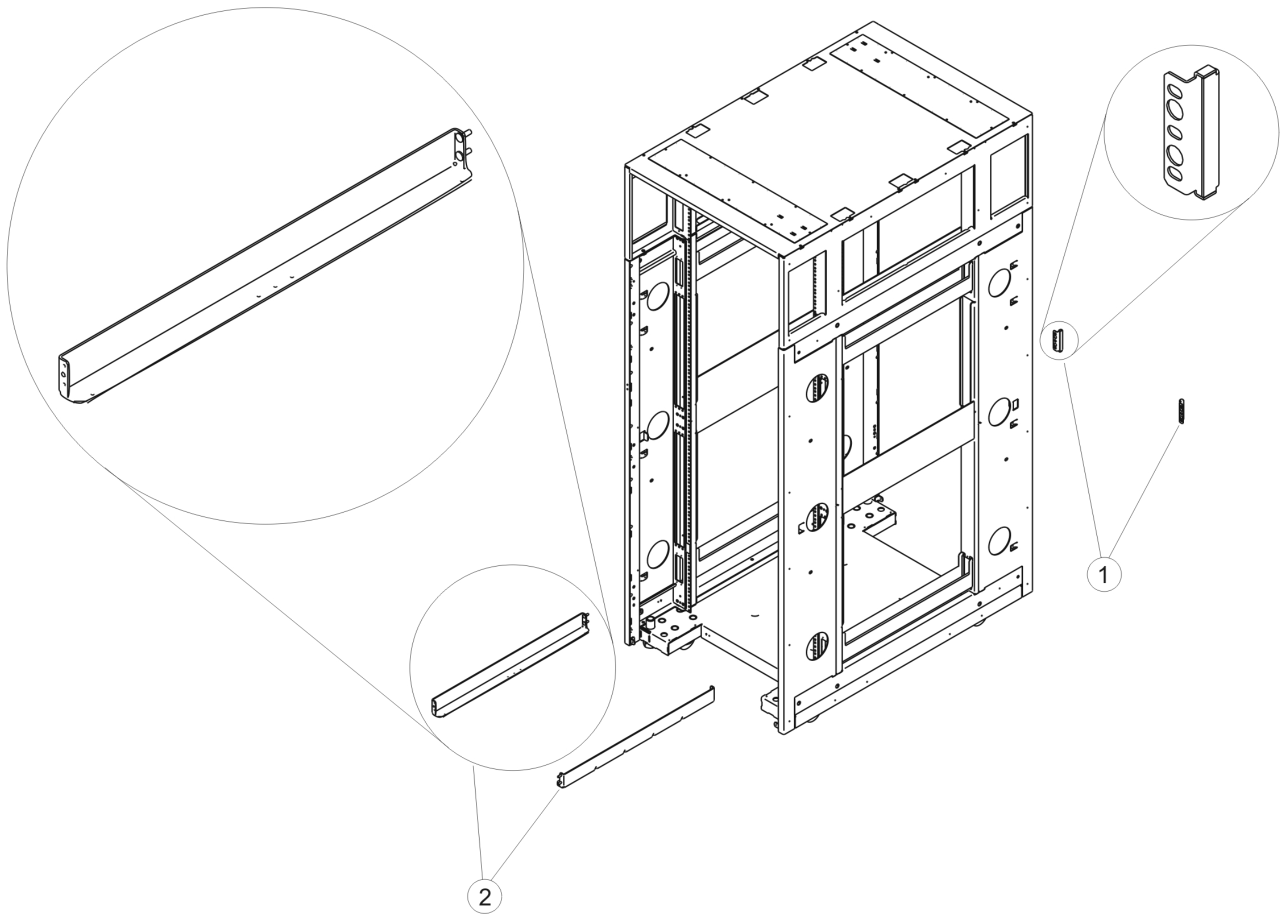


Table 46. HPS frame rails and brackets

Assembly index	Part number	Units	Description
		1	24 inch powered expansion rack FC 5792/8691 frame assembly
	77G0599	6	HPS, mounting screws
	74F1823	6	HPS, nut clips
1	44P3869	2	Rear bracket, HPS frame mounting
	77G0599	4	Rear bracket, mounting screws
	74F1823	4	Rear bracket, nut clips
2	07H5247	2	Rail, HPS frame mounting
	54G2882	4	Rail, mounting screws

Rack subsystem for switch-only frames

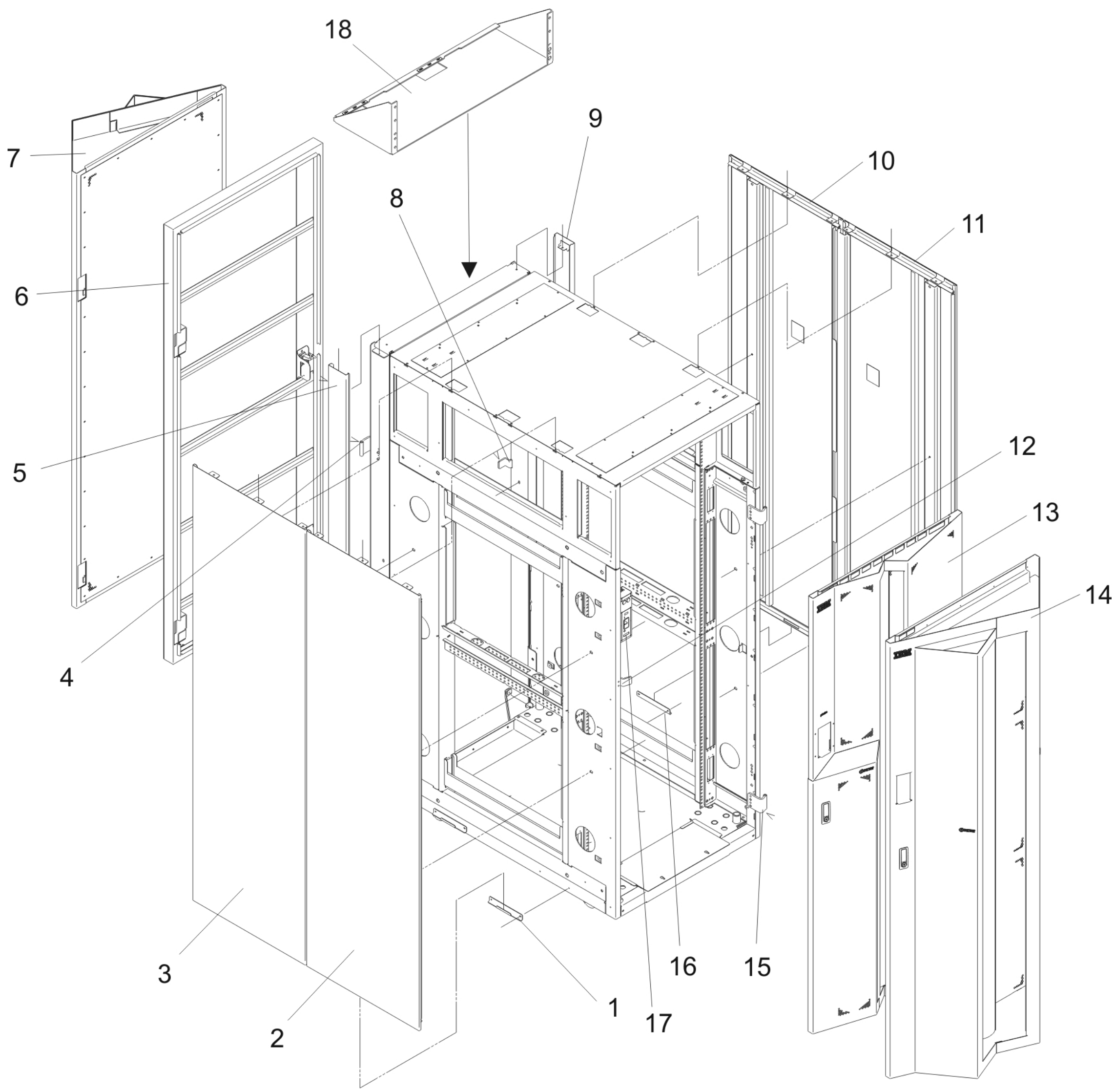


Table 47. Rack subsystem for switch-only frames

Assembly index	Part number	Units	Description
1	05N6585	2	J-Bracket
	2665528	4	Screw
2	12R6858	1	Cover, Right Side
	77G0599	3	Screw
3	44P0125	1	Cover, Left Side
	77G0599	3	Screw
4	11P4106	2	Hinge
	11P3535	2	Hinge
	2665525	4	Screw
5	44P2819	1	Extender Cover
	77G0599	1	Screw
6	44P2610	1	Cover, Rear (Non-Acoustic)
7	44P2792	1	Cover, Rear (Acoustic)
8	11P1093	1	Latch, Rear
	44P2459	1	Latch
	54G2882	2	Screw
9	44P2819	1	Extender, Cover
	77G0599	1	Screw
10	12R6858	1	Cover, Right Side
	77G0599	3	Screw
11	44P0125	1	Cover, Left Side
	77G0599	3	Screw
12	11P1097	1	Latch, Front
	44P2459	1	Latch
	54G2882	2	Screw
13	44P2610	1	Cover, Front (Non-Acoustic)
14	44P2791	1	Cover, Front (Acoustic)
15	11P3535	2	Hinge
	2665525	4	Screw
16	05N6585	2	J-Bracket
		4	Screw
17	44P2718	1	Universal Emergency Power Off (UEPO) Switch
18	44P2680	AR	Shelf
		1	Power Subsystem (refer to “Frame power subsystem (BPA) for switch-only frames” on page 228)
	44P2670	3	Air Filter (installed in front cover)
		1	Tool Box

Frame power subsystem (BPA) for switch-only frames

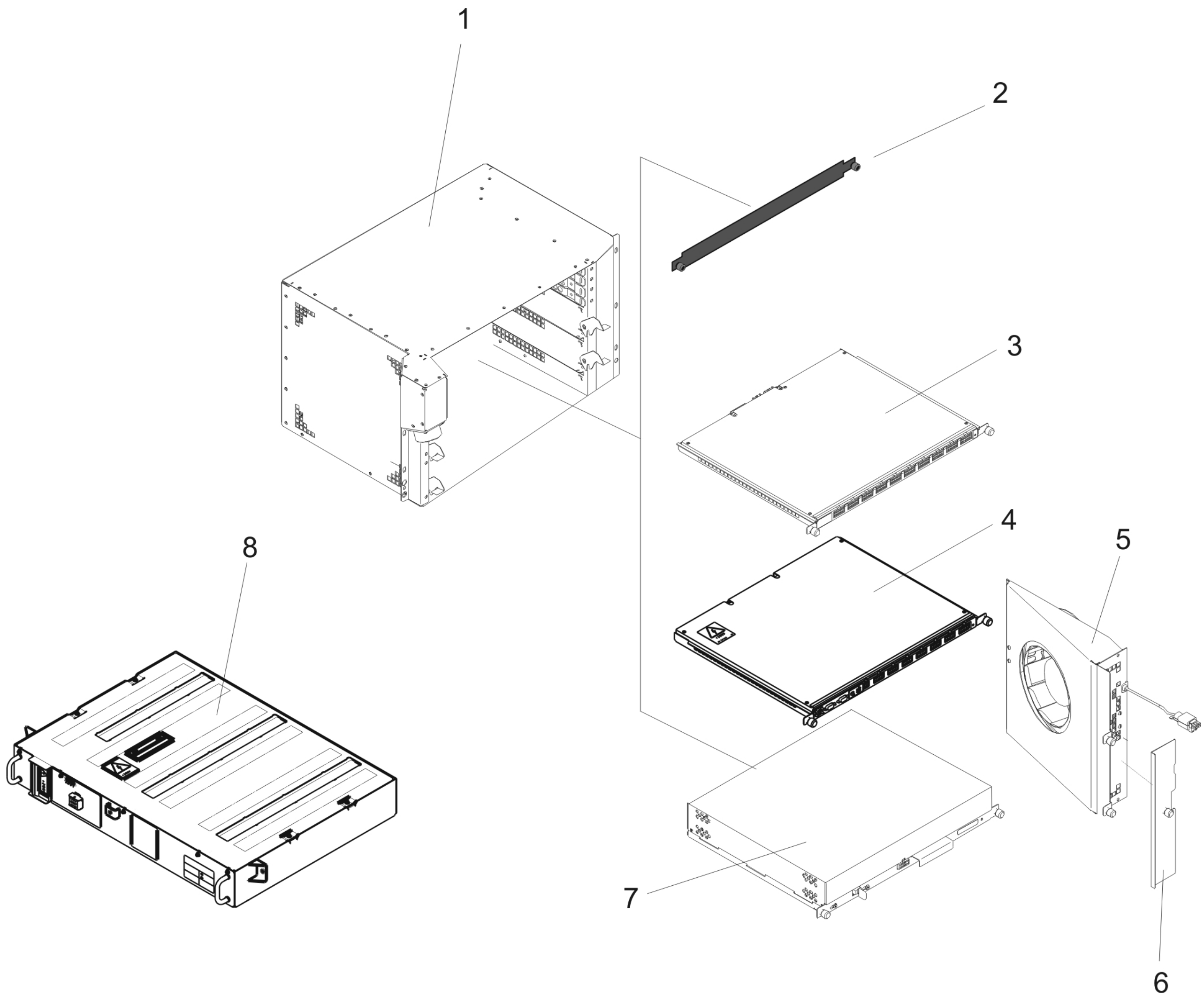


Table 48. Frame power subsystem for switch-only frames

Assembly index	Part number	Units	Description
		1	Bulk Power Assembly
1	44P4543	2	Bulk Power Enclosure (BPE)
2	12K0565	AR	Airflow blank **Note:** The Bulk Power Hub (BPH) and Bulk Power Jumper (BPJ) are not used with the switch-only frame. With this frame configuration, airflow blanks are used in place of those components.
3	12R6302	0 or 2	Bulk Power Distributor (BPD)
4	12R6304	2	Bulk Power Controller (BPC)
5	44P3865	2	Bulk Power Fan (BPF)
6	44P0550	2	Fan Cover Plate
7	12R7022	2, 4, or 6	Bulk Power Regulator (BPR)
8	11P3732	0, 2, 4, or 6	Integrated Battery Feature (IBF) **Note:** Optional IBF units are frame mounted. All other BPA components are installed in the BPEs.

EMC shielding for standard server frames

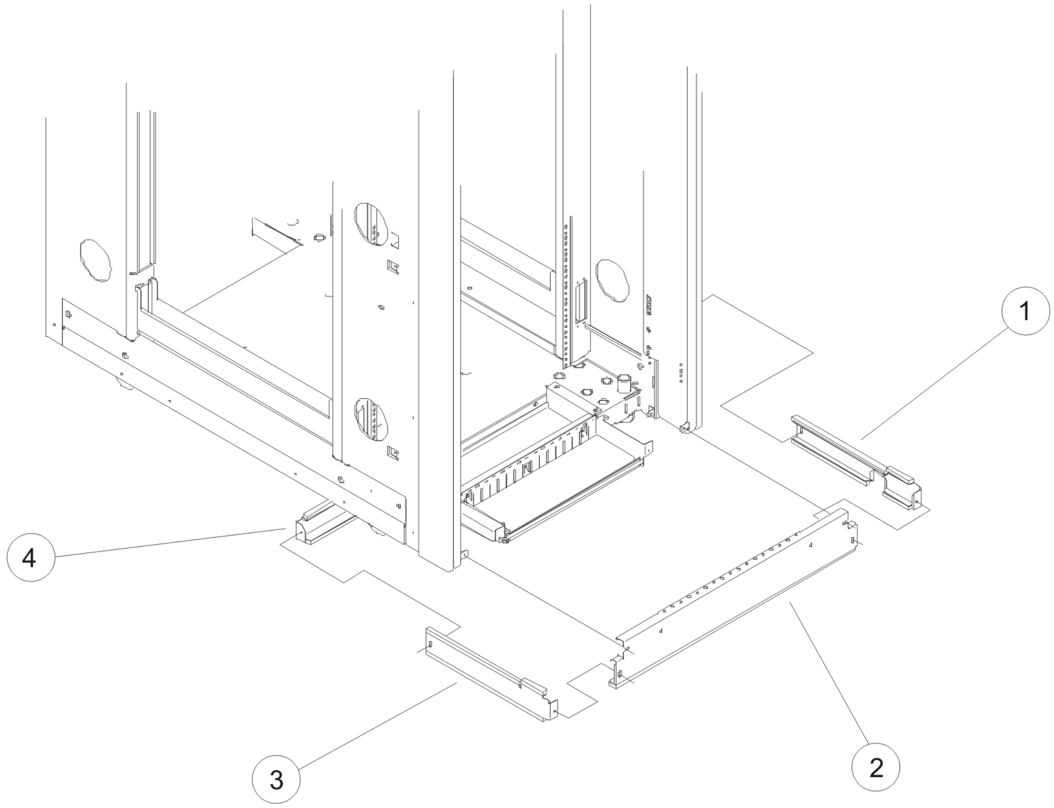


Table 49. EMC skirts and gaskets for standard server frames.

Assembly index	Part number	Units	Description
		1	Server frame assembly, standard
1	60G7605		Kit, EMC skirt
1	44P3825	1	EMC skirt, right side (included in PN 60G7605)
2	44P3823	1	EMC skirt, front (included in PN 60G7605)
3	44P3824	1	EMC skirt, left side (included in PN 60G7605)
4	44P3826	1	EMC skirt, rear (included in PN 60G7605)
	16R0921		Kit, EMC gaskets for 24 inch powered expansion rack FC 5792/8691 server frames with acoustic covers
Note: If the 24 inch powered expansion rack FC 5792/8691 server frame is configured with an expansion frame, an additional EMC skirt set must be installed on the expansion frame.			

HPS ship group

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Table 50. HPS ship group

Assembly index	Part number	Units	Description
	44P4060	1	Service tool kit (FC 3756)
	• 44P2120		• Wrap plug, copper cable use
	• 44P4763		• Wrap cable, fiber optic
	• 12R6856		• Wrap, Switch Port Connection card
	• 16R0157		• Copper switch cable, diagnostic (5 m)

BPD cables

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Table 51. BPD cables

Assembly index	Part number	Units	Description
	11P4734	1	BPD3 cable 0, 1
	11P4735	1	BPD3 cable 0, 1
	11P4734	1	BPD3 cable 0, 1
	11P4735	1	BPD3 cable 0, 1
	11P4734	1	BPD3 cable 2, 3
	11P4735	1	BPD3 cable 2, 3
	11P4734	1	BPD3 cable 2, 3
	11P4735	1	BPD3 cable 2, 3
	11P4734	1	BPD3 cable 4, 5
	11P4735	1	BPD3 cable 4, 5
	11P4734	1	BPD3 cable 4, 5
	11P4735	1	BPD3 cable 4, 5
	11P4734	1	BPD3 cable 6, 7
	11P4735	1	BPD3 cable 6, 7
	11P4734	1	BPD3 cable 6, 7
	11P4735	1	BPD3 cable 6, 7
	11P4734	1	BPD3 cable IBF
	11P4735	1	BPD3 cable IBF
	11P4734	1	BPD3 cable IBF
	11P4735	1	BPD3 cable IBF

System power cables

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Table 52. System power cables

Assembly index	Part number	Units	Description
	44P2290	2	Line Power Cord, US, Canada, Japan, etc., 200-240 V ac, 6 AWG/Type W, 14 feet, IEC 309 100 A plug
	44P2436	2	Line Power Cord, US, Canada, Japan, etc., 200-240 V ac, 6 AWG/Type W, 14 feet, IEC 309, 60 A plug
	11P0916	2	Line Power Cord, US, Canada, Japan, etc., 480 V ac, 10 AWG, 14 feet, IEC 309, 30 A plug
	44P2289	2	Line Power Cord, US, Chicago, 200-240 V ac, 6 AWG/Type W, 6 feet, IEC 309, 100 A plug
	44P2435	2	Line Power Cord, US, Chicago, 200-240 V ac, 6 AWG/Type W, 6 feet, IEC 309, 60 A plug
	11P0914	2	Line Power Cord, US, Chicago, 480 V ac, 10 AWG/Type W, 6 feet, IEC 309, 30 A plug
	11P0918	2	Line Power Cord, World Trade, 380-415 V ac, 8 AWG (40 A maximum), 14 feet, No plug

Appendix A. FRU identification codes

The information in this section describes “HPSNM FRU identification codes” on page 240 and “Network status codes on HPSNM” on page 271.

FRU identification codes with the format BBXXXXXX
Refer to Table 53 on page 240 for:
- An error description as reported in Service Focal Point (SFP)
- Diagnostic procedures for the indicated FRUs
- A reference to the associated MAPs

Network fault messages reported through HPSNM
Refer to Table 54 on page 271 for:
- A listing of the network fault messages
- An explanation of the message
- The recommended service action for that message

Attention: HPS network components have built-in redundancies that provide high availability service. Because of these design features, a link may appear operational even though it has a serviceable event posted against it. Under these conditions, you should perform the service actions for the reported event. Although you may be able to defer maintenance, the network may experience degraded performance until the service actions are complete.

Before replacing FRUs

Service Focal Point (SFP) has four possible methods of reporting faulty links in the FRU information panel:

1. Both the server side and switch side of the failing link are given in the FRU list
2. Only the switch side of the failing link is reported
3. Only the server side of the failing link is reported
4. Only a riser (Switch Port Connection card) associated with the failing link is reported

Since there are multiple reporting methods, the FRU listed in SFP may only be a symptom of the failure and may not be the actual failing FRU. Replacing the FRU listed in SFP without performing additional tests may not fix the problem and may lead to extended service time.

Therefore, **before** you replace any FRUs related to the error codes listed in Table 53, you **must** run diagnostics using the High Performance Switch Network Manager (HPSNM) (refer to “Running diagnostics from HPSNM” on page 172). HPSNM diagnostic procedures analyze all components associated with the reported error code and reduce the overall service time.

Notes:

1. If you look at the AIX error logs you will find additional, secondary error codes that result from the primary failure.
2. Service Focal Point filters the AIX error logs and does not list the secondary error codes.
3. If you run diagnostics from AIX, you will receive misleading from the secondary error codes.

HPSNM FRU identification codes

BBXXXXXX FRU identification codes

Attention: HPS network components have built-in redundancies that provide high availability service. Because of these design features, a link may appear operational even though it has a serviceable event posted against it. Under these conditions, you should perform the service actions for the reported event. Although you may be able to defer maintenance, the network may experience degraded performance until the service actions are complete.

Table 53. BBXXXXXX FRU identification codes

Error code	Message in SFP	Error Description	Action
BB100A00	1108 : A Switch Reported a Critical Internal Error, which resulted in a reset of the chip. This will suppress link errors on all links connected to this chip.	Next Chunk Linked List Parity Error	Replace the switch planar
BB100A01	1108 : A Switch Reported a Critical Internal Error, which resulted in a reset of the chip. This will suppress link errors on all links connected to this chip.	Free Space Linked List Parity Error	Replace the switch planar
BB100A02	1108 : A Switch Reported a Critical Internal Error, which resulted in a reset of the chip. This will suppress link errors on all links connected to this chip.	Repeat Count Array Parity Error	Replace the switch planar
BB100A03	1108 : A Switch Reported a Critical Internal Error, which resulted in a reset of the chip. This will suppress link errors on all links connected to this chip.	Next Packet Linked List Parity Error	Replace the switch planar
BB100A04	1108 : A Switch Reported a Critical Internal Error, which resulted in a reset of the chip. This will suppress link errors on all links connected to this chip.	Central Queue Internal Error	Replace the switch planar
BB100A05	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Central Queue Reserved Space Overflow Error	Call your next level of support
BB100A06	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Central Queue Multicast > Reserve Error	Call your next level of support
BB100A09	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	Incorrect ECRC/Data Parity on a Service Packet Error	Replace the switch planar
BB100A0A	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	Service Array Overflow Error	Replace the switch planar

Table 53. BBXXXXXX FRU identification codes (continued)

Error code	Message in SFP	Error Description	Action
BB100A0B	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	Parity Error on Service Array Input	Replace the switch planar
BB100A0C	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	Parity Error on Route Table	Replace the switch planar
BB100A0D	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	Parity Error on Service Array Output	Replace the switch planar
BB100A0F	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	Service Internal Error	Replace the switch planar
BB100A10	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	TOD Parity Error	Replace the switch planar
BB100A11	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	TOD Update Missing Error	Call your next level of support
BB100A13	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	Lost TOD Pulse Error	Replace the switch planar
BB100A15	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	TOD Ring Parity Error	Replace the switch planar
BB10F00A	1301 : Suspect a faulty switch board because of a combination of errors	suspect_swboardext	1. Replace the switch planar 2. Go to“Procedure 1” on page 268
BB10F00B	1301 : Suspect a faulty switch board because of a combination of errors	suspect_swboardint	1. Replace the switch planar 2. Go to“Procedure 1” on page 268
BB10F00F	1300 : Suspect a faulty switch chip because of a combination of errors.	suspect_swchipext	1. Replace the switch planar 2. Go to“Procedure 2” on page 269
BB10F010	1300 : Suspect a faulty switch chip because of a combination of errors.	suspect_swchipint	1. Replace the switch planar 2. Go to“Procedure 2” on page 269
BB10F040	1305: A combination of bad frame numbers in chip locations suggests either a configuration problem, or a potential DCA problem.	Multiple Chip Location Problem: Frame	1. Assure that Frame number is set (probably involves setting it again and then restarting HPSNM) 2. Check UPIC cable plugging into Switch DCAs 3. Replace E1 in the Switch cage in the FRU list 4. Replace E2 in the Switch cage in the FRU list 5. Replace the Switch in the FRU list 6. Replace BPC-A 7. Replace BPC-B

Table 53. BBXXXXXX FRU identification codes (continued)

Error code	Message in SFP	Error Description	Action
BB10F041	1306: A combination of bad cage or chip numbers in chip locations suggests either a configuration problem, or a potential DCA problem.	Multiple Chip Location Problem: Cage or Chip	1. Check UPIC cable plugging into Switch DCAs 2. Replace E1 in the Switch cage in the FRU list 3. Replace E2 in the Switch cage in the FRU list 4. Replace the Switch in the FRU list 5. Replace BPC-A 6. Replace BPC-B
BB10F0F0	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	Bad Switch Chip ID	Replace the switch planar
BB10F0F1	1107 : A Switch Chip has a bad Self Test Signature	Bad Switch Chip Signature	Replace the switch planar
BB10F0F3	1505 : VPD Problem on a Switch	Switch VPD unavailable	Replace the switch planar
BB10F0F4	1505 : VPD Problem on a Switch	Invalid Switch VPD checksum	Replace the switch planar
BB10F0F7	1620: Incorrect Frame Number in a Switch Chip Location Register.	Bad Frame number in Switch Chip ID	1. If there are multiple occurrences of BB10F0F7 with the same Switch in the FRU list, proceed to the instructions for BB10F041 2. Replace the first Switch in the FRU list
BB10F0F8	1621: Incorrect Cage Number in a Switch Chip Location Register.	Bad Cage number in Switch Chip ID	1. If there are multiple occurrences of BB10F0F7 with the same Switch in the FRU list, proceed to the instructions for BB10F041 2. Replace the first Switch in the FRU list
BB10F0F9	1622: Incorrect Chip Number in a Switch Chip Location Register.	Bad Chip number in Switch Chip ID	1. If there are multiple occurrences of BB10F0F7 with the same Switch in the FRU list, proceed to the instructions for BB10F041 2. Replace the first Switch in the FRU list
BB10F0FA	1623: Incorrect Frame and Cage Numbers in a Switch Chip Location Register.	Bad Frame and Cage numbers in Switch Chip ID	1. If there are multiple occurrences of BB10F0F7 with the same Switch in the FRU list, proceed to the instructions for BB10F041 2. Replace the first Switch in the FRU list
BB200400	1100 : A Switch Reported an Error on an External Link	LCRC Error0	1. Check for a loose or cocked cable 2. Go to "Procedure 3" on page 269
BB200401	1100 : A Switch Reported an Error on an External Link	LCRC Error1	1. Check for a loose or cocked cable 2. Go to "Procedure 3" on page 269
BB200402	1100 : A Switch Reported an Error on an External Link	LCRC Error2	1. Check for a loose or cocked cable 2. Go to "Procedure 3" on page 269

Table 53. BBXXXXXX FRU identification codes (continued)

Error code	Message in SFP	Error Description	Action
BB200403	1100 : A Switch Reported an Error on an External Link	LCRC Error3	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB200404	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	LCRC Error4	Replace the switch planar
BB200405	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	LCRC Error5	Replace the switch planar
BB200406	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	LCRC Error6	Replace the switch planar
BB200407	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	LCRC Error7	Replace the switch planar
BB200408	1100 : A Switch Reported an Error on an External Link	LCRC Threshold Error0	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB200409	1100 : A Switch Reported an Error on an External Link	LCRC Threshold Error1	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB20040A	1100 : A Switch Reported an Error on an External Link	LCRC Threshold Error2	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB20040B	1100 : A Switch Reported an Error on an External Link	LCRC Threshold Error3	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB20040C	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	LCRC Threshold Error4	Replace the switch planar
BB20040D	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	LCRC Threshold Error5	Replace the switch planar
BB20040E	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	LCRC Threshold Error6	Replace the switch planar
BB20040F	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	LCRC Threshold Error7	Replace the switch planar
BB200410	1100 : A Switch Reported an Error on an External Link	ECRC Error0	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB200411	1100 : A Switch Reported an Error on an External Link	ECRC Error1	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269

Table 53. BBXXXXXX FRU identification codes (continued)

Error code	Message in SFP	Error Description	Action
BB200412	1100 : A Switch Reported an Error on an External Link	ECRC Error2	1. Check for a loose or cocked cable 2. Go to "Procedure 3" on page 269
BB200413	1100 : A Switch Reported an Error on an External Link	ECRC Error3	1. Check for a loose or cocked cable 2. Go to "Procedure 3" on page 269
BB200414	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	ECRC Error4	Replace the switch planar
BB200415	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	ECRC Error5	Replace the switch planar
BB200416	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	ECRC Error6	Replace the switch planar
BB200417	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	ECRC Error7	Replace the switch planar
BB200418	1100 : A Switch Reported an Error on an External Link	ECRC Threshold Error0	1. Check for a loose or cocked cable 2. Go to "Procedure 3" on page 269
BB200419	1100 : A Switch Reported an Error on an External Link	ECRC Threshold Error1	1. Check for a loose or cocked cable 2. Go to "Procedure 3" on page 269
BB20041A	1100 : A Switch Reported an Error on an External Link	ECRC Threshold Error2	1. Check for a loose or cocked cable 2. Go to "Procedure 3" on page 269
BB20041B	1100 : A Switch Reported an Error on an External Link	ECRC Threshold Error3	1. Check for a loose or cocked cable 2. Go to "Procedure 3" on page 269
BB20041C	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	ECRC Threshold Error4	Replace the switch planar
BB20041D	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	ECRC Threshold Error5	Replace the switch planar
BB20041E	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	ECRC Threshold Error6	Replace the switch planar
BB20041F	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	ECRC Threshold Error7	Replace the switch planar
BB200500	1101 : A Switch Reported an Error on an External Link, which resulted in a re-initialization of the link.	Receive Buffer Overflow Error0	1. Check for a loose or cocked cable 2. Go to "Procedure 3" on page 269

Table 53. BBXXXXXX FRU identification codes (continued)

Error code	Message in SFP	Error Description	Action
BB200501	1101 : A Switch Reported an Error on an External Link, which resulted in a re-initialization of the link.	Receive Buffer Overflow Error1	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB200502	1101 : A Switch Reported an Error on an External Link, which resulted in a re-initialization of the link.	Receive Buffer Overflow Error2	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB200503	1101 : A Switch Reported an Error on an External Link, which resulted in a re-initialization of the link.	Receive Buffer Overflow Error3	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB200504	1105 : A Switch Reported an Internal Error on an Internal Link, which resulted in a re-initialization of the link. This will suppress other link errors.	Receive Buffer Overflow Error4	Replace the switch planar
BB200505	1105 : A Switch Reported an Internal Error on an Internal Link, which resulted in a re-initialization of the link. This will suppress other link errors.	Receive Buffer Overflow Error5	Replace the switch planar
BB200506	1105 : A Switch Reported an Internal Error on an Internal Link, which resulted in a re-initialization of the link. This will suppress other link errors.	Receive Buffer Overflow Error6	Replace the switch planar
BB200507	1105 : A Switch Reported an Internal Error on an Internal Link, which resulted in a re-initialization of the link. This will suppress other link errors.	Receive Buffer Overflow Error7	Replace the switch planar
BB200508	1100 : A Switch Reported an Error on an External Link	TSEQ Number Error0	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB200509	1100 : A Switch Reported an Error on an External Link	TSEQ Number Error1	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB20050A	1100 : A Switch Reported an Error on an External Link	TSEQ Number Error2	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB20050B	1100 : A Switch Reported an Error on an External Link	TSEQ Number Error3	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB20050C	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	TSEQ Number Error4	Replace the switch planar
BB20050D	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	TSEQ Number Error5	Replace the switch planar

Table 53. BBXXXXXX FRU identification codes (continued)

Error code	Message in SFP	Error Description	Action
BB20050E	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	TSEQ Number Error6	Replace the switch planar
BB20050F	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	TSEQ Number Error7	Replace the switch planar
BB200510	1001 : A Link Synchronization Error was Reported on an External Link. This will suppress the reporting of other associated link errors.	Link Synchronization Failure Error0	1. Check for a loose or cocked cable 2. Go to "Procedure 3" on page 269
BB200511	1001 : A Link Synchronization Error was Reported on an External Link. This will suppress the reporting of other associated link errors.	Link Synchronization Failure Error1	1. Check for a loose or cocked cable 2. Go to "Procedure 3" on page 269
BB200512	1001 : A Link Synchronization Error was Reported on an External Link. This will suppress the reporting of other associated link errors.	Link Synchronization Failure Error2	1. Check for a loose or cocked cable 2. Go to "Procedure 3" on page 269
BB200513	1001 : A Link Synchronization Error was Reported on an External Link. This will suppress the reporting of other associated link errors.	Link Synchronization Failure Error3	1. Check for a loose or cocked cable 2. Go to "Procedure 3" on page 269
BB200514	1002 : A Link Synchronization Error was Reported on an Internal Link. This will suppress the reporting of other associated link errors.	Link Synchronization Failure Error4	Replace the first FRU in the FRU list.
BB200515	1002 : A Link Synchronization Error was Reported on an Internal Link. This will suppress the reporting of other associated link errors.	Link Synchronization Failure Error5	Replace the first FRU in the FRU list.
BB200516	1002 : A Link Synchronization Error was Reported on an Internal Link. This will suppress the reporting of other associated link errors.	Link Synchronization Failure Error6	Replace the first FRU in the FRU list.
BB200517	1002 : A Link Synchronization Error was Reported on an Internal Link. This will suppress the reporting of other associated link errors.	Link Synchronization Failure Error7	Replace the first FRU in the FRU list.
BB200518	1100 : A Switch Reported an Error on an External Link	Reserved Type Error0	1. Check for a loose or cocked cable 2. Go to "Procedure 3" on page 269

Table 53. BBXXXXXX FRU identification codes (continued)

Error code	Message in SFP	Error Description	Action
BB200519	1100 : A Switch Reported an Error on an External Link	Reserved Type Error1	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB20051A	1100 : A Switch Reported an Error on an External Link	Reserved Type Error2	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB20051B	1100 : A Switch Reported an Error on an External Link	Reserved Type Error3	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB20051C	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	Reserved Type Error4	Replace the switch planar
BB20051D	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	Reserved Type Error5	Replace the switch planar
BB20051E	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	Reserved Type Error6	Replace the switch planar
BB20051F	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	Reserved Type Error7	Replace the switch planar
BB200600	1100 : A Switch Reported an Error on an External Link	Missing Header Flit Error0	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB200601	1100 : A Switch Reported an Error on an External Link	Missing Header Flit Error1	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB200602	1100 : A Switch Reported an Error on an External Link	Missing Header Flit Error2	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB200603	1100 : A Switch Reported an Error on an External Link	Missing Header Flit Error3	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB200604	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	Missing Header Flit Error4	Replace the switch planar
BB200605	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	Missing Header Flit Error5	Replace the switch planar
BB200606	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	Missing Header Flit Error6	Replace the switch planar
BB200607	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	Missing Header Flit Error7	Replace the switch planar

Table 53. BBXXXXXX FRU identification codes (continued)

Error code	Message in SFP	Error Description	Action
BB200608	1100 : A Switch Reported an Error on an External Link	Missing Tail Flit Error0	1. Check for a loose or cocked cable 2. Go to "Procedure 3" on page 269
BB200609	1100 : A Switch Reported an Error on an External Link	Missing Tail Flit Error1	1. Check for a loose or cocked cable 2. Go to "Procedure 3" on page 269
BB20060A	1100 : A Switch Reported an Error on an External Link	Missing Tail Flit Error2	1. Check for a loose or cocked cable 2. Go to "Procedure 3" on page 269
BB20060B	1100 : A Switch Reported an Error on an External Link	Missing Tail Flit Error3	1. Check for a loose or cocked cable 2. Go to "Procedure 3" on page 269
BB20060C	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	Missing Tail Flit Error4	Replace the switch planar
BB20060D	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	Missing Tail Flit Error5	Replace the switch planar
BB20060E	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	Missing Tail Flit Error6	Replace the switch planar
BB20060F	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	Missing Tail Flit Error7	Replace the switch planar
BB200610	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Receive MC Packet too Long Error0	Call your next level of support
BB200611	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Receive MC Packet too Long Error1	Call your next level of support
BB200612	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Receive MC Packet too Long Error2	Call your next level of support
BB200613	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Receive MC Packet too Long Error3	Call your next level of support
BB200614	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Receive MC Packet too Long Error4	Call your next level of support

Table 53. BBXXXXXX FRU identification codes (continued)

Error code	Message in SFP	Error Description	Action
BB200615	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Receive MC Packet too Long Error5	Call your next level of support
BB200616	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Receive MC Packet too Long Error6	Call your next level of support
BB200617	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Receive MC Packet too Long Error7	Call your next level of support
BB200618	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	Receiver Internal Error0	Replace the switch planar
BB200619	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	Receiver Internal Error1	Replace the switch planar
BB20061A	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	Receiver Internal Error2	Replace the switch planar
BB20061B	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	Receiver Internal Error3	Replace the switch planar
BB20061C	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	Receiver Internal Error4	Replace the switch planar
BB20061D	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	Receiver Internal Error5	Replace the switch planar
BB20061E	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	Receiver Internal Error6	Replace the switch planar
BB20061F	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	Receiver Internal Error7	Replace the switch planar
BB200700	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Invalid Route Error0	Call your next level of support
BB200701	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Invalid Route Error1	Call your next level of support

Table 53. BBXXXXXX FRU identification codes (continued)

Error code	Message in SFP	Error Description	Action
BB200702	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Invalid Route Error2	Call your next level of support
BB200703	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Invalid Route Error3	Call your next level of support
BB200704	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Invalid Route Error4	Call your next level of support
BB200705	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Invalid Route Error5	Call your next level of support
BB200706	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Invalid Route Error6	Call your next level of support
BB200707	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Invalid Route Error7	Call your next level of support
BB200708	1102 : A Switch Reported an Internal Error on an External Link, which resulted in a re-initialization of the link. This will suppress other link errors.	Receiver Init State Machine Error0	1. Run diagnostics on the switch. If no FRU given, go to the following procedure: 2. Go to "Procedure 4" on page 269
BB200709	1102 : A Switch Reported an Internal Error on an External Link, which resulted in a re-initialization of the link. This will suppress other link errors.	Receiver Init State Machine Error1	1. Run diagnostics on the switch. If no FRU given, go to the following procedure: 2. Go to "Procedure 4" on page 269
BB20070A	1102 : A Switch Reported an Internal Error on an External Link, which resulted in a re-initialization of the link. This will suppress other link errors.	Receiver Init State Machine Error2	1. Run diagnostics on the switch. If no FRU given, go to the following procedure: 2. Go to "Procedure 4" on page 269
BB20070B	1102 : A Switch Reported an Internal Error on an External Link, which resulted in a re-initialization of the link. This will suppress other link errors.	Receiver Init State Machine Error3	1. Run diagnostics on the switch. If no FRU given, go to the following procedure: 2. Go to "Procedure 4" on page 269

Table 53. BBXXXXXX FRU identification codes (continued)

Error code	Message in SFP	Error Description	Action
BB20070C	1105 : A Switch Reported an Internal Error on an Internal Link, which resulted in a re-initialization of the link. This will suppress other link errors.	Receiver Init State Machine Error4	Replace the switch planar
BB20070D	1105 : A Switch Reported an Internal Error on an Internal Link, which resulted in a re-initialization of the link. This will suppress other link errors.	Receiver Init State Machine Error5	Replace the switch planar
BB20070E	1105 : A Switch Reported an Internal Error on an Internal Link, which resulted in a re-initialization of the link. This will suppress other link errors.	Receiver Init State Machine Error6	Replace the switch planar
BB20070F	1105 : A Switch Reported an Internal Error on an Internal Link, which resulted in a re-initialization of the link. This will suppress other link errors.	Receiver Init State Machine Error7	Replace the switch planar
BB200710	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Data on Disabled VL Error0	Call your next level of support
BB200711	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Data on Disabled VL Error1	Call your next level of support
BB200712	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Data on Disabled VL Error2	Call your next level of support
BB200713	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Data on Disabled VL Error3	Call your next level of support
BB200714	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Data on Disabled VL Error4	Call your next level of support
BB200715	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Data on Disabled VL Error5	Call your next level of support

Table 53. BBXXXXXX FRU identification codes (continued)

Error code	Message in SFP	Error Description	Action
BB200716	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Data on Disabled VL Error6	Call your next level of support
BB200717	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Data on Disabled VL Error7	Call your next level of support
BB200718	1102 : A Switch Reported an Internal Error on an External Link, which resulted in a re-initialization of the link. This will suppress other link errors.	Sender Internal Error0	1. Run diagnostics on the switch. If no FRU given, go to the following procedure: 2. Go to “Procedure 4” on page 269
BB200719	1102 : A Switch Reported an Internal Error on an External Link, which resulted in a re-initialization of the link. This will suppress other link errors.	Sender Internal Error1	1. Run diagnostics on the switch. If no FRU given, go to the following procedure: 2. Go to “Procedure 4” on page 269
BB20071A	1102 : A Switch Reported an Internal Error on an External Link, which resulted in a re-initialization of the link. This will suppress other link errors.	Sender Internal Error2	1. Run diagnostics on the switch. If no FRU given, go to the following procedure: 2. Go to “Procedure 4” on page 269
BB20071B	1102 : A Switch Reported an Internal Error on an External Link, which resulted in a re-initialization of the link. This will suppress other link errors.	Sender Internal Error3	1. Run diagnostics on the switch. If no FRU given, go to the following procedure: 2. Go to “Procedure 4” on page 269
BB20071C	1105 : A Switch Reported an Internal Error on an Internal Link, which resulted in a re-initialization of the link. This will suppress other link errors.	Sender Internal Error4	Replace the switch planar
BB20071D	1105 : A Switch Reported an Internal Error on an Internal Link, which resulted in a re-initialization of the link. This will suppress other link errors.	Sender Internal Error5	Replace the switch planar
BB20071E	1105 : A Switch Reported an Internal Error on an Internal Link, which resulted in a re-initialization of the link. This will suppress other link errors.	Sender Internal Error6	Replace the switch planar
BB20071F	1105 : A Switch Reported an Internal Error on an Internal Link, which resulted in a re-initialization of the link. This will suppress other link errors.	Sender Internal Error7	Replace the switch planar

Table 53. BBXXXXXX FRU identification codes (continued)

Error code	Message in SFP	Error Description	Action
BB200800	1101 : A Switch Reported an Error on an External Link, which resulted in a re-initialization of the link.	Sender Hang Detected Error0	1. Check for a loose or cocked cable 2. Go to "Procedure 3" on page 269
BB200801	1101 : A Switch Reported an Error on an External Link, which resulted in a re-initialization of the link.	Sender Hang Detected Error1	1. Check for a loose or cocked cable 2. Go to "Procedure 3" on page 269
BB200802	1101 : A Switch Reported an Error on an External Link, which resulted in a re-initialization of the link.	Sender Hang Detected Error2	1. Check for a loose or cocked cable 2. Go to "Procedure 3" on page 269
BB200803	1101 : A Switch Reported an Error on an External Link, which resulted in a re-initialization of the link.	Sender Hang Detected Error3	1. Check for a loose or cocked cable 2. Go to "Procedure 3" on page 269
BB200804	1105 : A Switch Reported an Internal Error on an Internal Link, which resulted in a re-initialization of the link. This will suppress other link errors.	Sender Hang Detected Error4	Replace the switch planar
BB200805	1105 : A Switch Reported an Internal Error on an Internal Link, which resulted in a re-initialization of the link. This will suppress other link errors.	Sender Hang Detected Error5	Replace the switch planar
BB200806	1105 : A Switch Reported an Internal Error on an Internal Link, which resulted in a re-initialization of the link. This will suppress other link errors.	Sender Hang Detected Error6	Replace the switch planar
BB200807	1105 : A Switch Reported an Internal Error on an Internal Link, which resulted in a re-initialization of the link. This will suppress other link errors.	Sender Hang Detected Error7	Replace the switch planar
BB200808	1100 : A Switch Reported an Error on an External Link	Missing RSEQ Error0	1. Check for a loose or cocked cable 2. Go to "Procedure 3" on page 269
BB200809	1100 : A Switch Reported an Error on an External Link	Missing RSEQ Error1	1. Check for a loose or cocked cable 2. Go to "Procedure 3" on page 269
BB20080A	1100 : A Switch Reported an Error on an External Link	Missing RSEQ Error2	1. Check for a loose or cocked cable 2. Go to "Procedure 3" on page 269
BB20080B	1100 : A Switch Reported an Error on an External Link	Missing RSEQ Error3	1. Check for a loose or cocked cable 2. Go to "Procedure 3" on page 269
BB20080C	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	Missing RSEQ Error4	Replace the switch planar

Table 53. BBXXXXXX FRU identification codes (continued)

Error code	Message in SFP	Error Description	Action
BB20080D	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	Missing RSEQ Error5	Replace the switch planar
BB20080E	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	Missing RSEQ Error6	Replace the switch planar
BB20080F	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	Missing RSEQ Error7	Replace the switch planar
BB200810	1100 : A Switch Reported an Error on an External Link	Retry Count Threshold Error0	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB200811	1100 : A Switch Reported an Error on an External Link	Retry Count Threshold Error1	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB200812	1100 : A Switch Reported an Error on an External Link	Retry Count Threshold Error2	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB200813	1100 : A Switch Reported an Error on an External Link	Retry Count Threshold Error3	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB200814	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	Retry Count Threshold Error4	Replace the switch planar
BB200815	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	Retry Count Threshold Error5	Replace the switch planar
BB200816	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	Retry Count Threshold Error6	Replace the switch planar
BB200817	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	Retry Count Threshold Error7	Replace the switch planar
BB200818	1100 : A Switch Reported an Error on an External Link	RSEQ Number Error0	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB200819	1100 : A Switch Reported an Error on an External Link	RSEQ Number Error1	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB20081A	1100 : A Switch Reported an Error on an External Link	RSEQ Number Error2	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB20081B	1100 : A Switch Reported an Error on an External Link	RSEQ Number Error3	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269

Table 53. BBXXXXXX FRU identification codes (continued)

Error code	Message in SFP	Error Description	Action
BB20081C	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	RSEQ Number Error4	Replace the switch planar
BB20081D	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	RSEQ Number Error5	Replace the switch planar
BB20081E	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	RSEQ Number Error6	Replace the switch planar
BB20081F	1104 : A Switch Reported an Error on an Internal Link, which resulted in a re-initialization of the link.	RSEQ Number Error7	Replace the switch planar
BB200900	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	ECRC/Parity Error on Data0	1. Check for another event in SFP that calls out an SPC card on this switch planar: a. Return to the ″Serviceable Event Overview″ panel in SFP b. In the ″Descriptive Text″ column, look for ″A Switch/Adapter Reported an Error on an External Link″ c. Record the details for that event including FRU information d. If the FRU list calls out an SPC card on this switch planar, then close out the BB200900, BB200901, BB200902, or BB200903 event: 1) In the ″Serviceable Event Details″ panel, click on the Comments button 2) Enter notes stating: • That the event for the SPC card is considered to have caused the BB20090 event • Record the refcode for the SPC card event • Record the FRU information for the event e. Service the SPC card event using the new refcode 2. If you do not find an event that calls out a SPC card on this switch planar, replace the switch planar

Table 53. BBXXXXXX FRU identification codes (continued)

Error code	Message in SFP	Error Description	Action
BB200901	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	ECRC/Parity Error on Data1	1. Check for another event in SFP that calls out an SPC card on this switch planar: a. Return to the ″Serviceable Event Overview″ panel in SFP b. In the ″Descriptive Text″ column, look for ″A Switch/Adapter Reported an Error on an External Link″ c. Record the details for that event including FRU information d. If the FRU list calls out an SPC card on this switch planar, then close out the BB200900, BB200901, BB200902, or BB200903 event: 1) In the ″Serviceable Event Details″ panel, click on the Comments button 2) Enter notes stating: • That the event for the SPC card is considered to have caused the BB20090 event • Record the refcode for the SPC card event • Record the FRU information for the event e. Service the SPC card event using the new refcode 2. If you do not find an event that calls out a SPC card on this switch planar, replace the switch planar

Table 53. BBXXXXXX FRU identification codes (continued)

Error code	Message in SFP	Error Description	Action
BB200902	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	ECRC/Parity Error on Data2	1. Check for another event in SFP that calls out an SPC card on this switch planar: a. Return to the ″Serviceable Event Overview″ panel in SFP b. In the ″Descriptive Text″ column, look for ″A Switch/Adapter Reported an Error on an External Link″ c. Record the details for that event including FRU information d. If the FRU list calls out an SPC card on this switch planar, then close out the BB200900, BB200901, BB200902, or BB200903 event: 1) In the ″Serviceable Event Details″ panel, click on the Comments button 2) Enter notes stating: • That the event for the SPC card is considered to have caused the BB20090 event • Record the refcode for the SPC card event • Record the FRU information for the event e. Service the SPC card event using the new refcode 2. If you do not find an event that calls out a SPC card on this switch planar, replace the switch planar

Table 53. BBXXXXXX FRU identification codes (continued)

Error code	Message in SFP	Error Description	Action
BB200903	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	ECRC/Parity Error on Data3	1. Check for another event in SFP that calls out an SPC card on this switch planar: a. Return to the ″Serviceable Event Overview″ panel in SFP b. In the ″Descriptive Text″ column, look for ″A Switch/Adapter Reported an Error on an External Link″ c. Record the details for that event including FRU information d. If the FRU list calls out an SPC card on this switch planar, then close out the BB200900, BB200901, BB200902, or BB200903 event: 1) In the ″Serviceable Event Details″ panel, click on the Comments button 2) Enter notes stating: • That the event for the SPC card is considered to have caused the BB20090 event • Record the refcode for the SPC card event • Record the FRU information for the event e. Service the SPC card event using the new refcode 2. If you do not find an event that calls out a SPC card on this switch planar, replace the switch planar
BB200904	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	ECRC/Parity Error on Data4	Replace the switch planar
BB200905	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	ECRC/Parity Error on Data5	Replace the switch planar
BB200906	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	ECRC/Parity Error on Data6	Replace the switch planar
BB200907	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	ECRC/Parity Error on Data7	Replace the switch planar
BB200908	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	Parity Error on TOD0	Replace the switch planar
BB200909	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	Parity Error on TOD1	Replace the switch planar
BB20090A	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	Parity Error on TOD2	Replace the switch planar

Table 53. BBXXXXXX FRU identification codes (continued)

Error code	Message in SFP	Error Description	Action
BB20090B	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	Parity Error on TOD3	Replace the switch planar
BB20090C	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	Parity Error on TOD4	Replace the switch planar
BB20090D	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	Parity Error on TOD5	Replace the switch planar
BB20090E	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	Parity Error on TOD6	Replace the switch planar
BB20090F	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	Parity Error on TOD7	Replace the switch planar
BB200910	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	Credit Count Overflow Error0	Replace the switch planar
BB200911	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	Credit Count Overflow Error1	Replace the switch planar
BB200912	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	Credit Count Overflow Error2	Replace the switch planar
BB200913	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	Credit Count Overflow Error3	Replace the switch planar
BB200914	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	Credit Count Overflow Error4	Replace the switch planar
BB200915	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	Credit Count Overflow Error5	Replace the switch planar
BB200916	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	Credit Count Overflow Error6	Replace the switch planar
BB200917	1109 : A Switch Reported a non-Critical Internal Error. No chip reset was required.	Credit Count Overflow Error7	Replace the switch planar
BB200918	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Received Invalid Packet Error0	Call your next level of support
BB200919	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Received Invalid Packet Error1	Call your next level of support

Table 53. BBXXXXXX FRU identification codes (continued)

Error code	Message in SFP	Error Description	Action
BB20091A	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Received Invalid Packet Error2	Call your next level of support
BB20091B	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Received Invalid Packet Error3	Call your next level of support
BB20091C	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Received Invalid Packet Error4	Call your next level of support
BB20091D	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Received Invalid Packet Error5	Call your next level of support
BB20091E	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Received Invalid Packet Error6	Call your next level of support
BB20091F	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Received Invalid Packet Error7	Call your next level of support
BB200A08	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Chip ID Error	Call your next level of support
BB200A0E	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Undefined Service Command Error	Call your next level of support
BB200A12	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Invalid TOD Load Error	Call your next level of support
BB200A14	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Invalid TOD Propagate Error	Call your next level of support

Table 53. BBXXXXXX FRU identification codes (continued)

Error code	Message in SFP	Error Description	Action
BB20F01E	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	New hang_detect	Call your next level of support
BB20F01F	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	New unconsumed_route	Call your next level of support
BB20F020	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	New tod_master	Call your next level of support
BB20F021	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	New Receive MC Packet Too Long	Call your next level of support
BB20F022	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	New Missing Tail	Call your next level of support
BB20F023	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	New Chip ID Error	Call your next level of support
BB20F024	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	New Invalid TOD Load Error	Call your next level of support
BB20F025	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	New Invalid TOD Propagate Error	Call your next level of support
BB20F026	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	New Service Array Overflow Error	Call your next level of support
BB20F027	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	New Undefined Service Command Error	Call your next level of support

Table 53. BBXXXXXX FRU identification codes (continued)

Error code	Message in SFP	Error Description	Action
BB20F028	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	New First Byte Error	Call your next level of support
BB20F0FD	1627: An external switch link cannot time.	An external switch link cannot time.	1. Check for a loose or cocked cable 2. Go to "Procedure 3" on page 269
BB20F0FE	1625: A wrap plug was found on a link that is not in diagnostic mode.	Wrap plug installed	1. Remove the Wrap plug from the port. The port is designated by the cable service location in the FRU list. 2. If a cable should be connected to the port, then connect the cable. Verify that the other side is also connected.
BB20F0FF	1002 : A Link Synchronization Error was Reported on an Internal Link. This will suppress the reporting of other associated link errors.	Link not Timed	1. Check for loose or cocked cable 2. Go to "Procedure 3" on page 269
BB20F101	1600 : The Link Verify Diagnostic Test has found a problem with a Switch Cable in frame x, cage y.	Cable Fail	Replace the cable connected to the port or switch in the FRU list
BB20F103	1602 : The Link Verify Diagnostic Test has found a problem with a Switch Planar in frame x, cage y.	Adapter Fail	Replace the first Switch in the FRU list (location code U7045.SW4.SerialNumber-P1)
BB20F201	1604 : The Line Continuity Diagnostic Test has found a problem with a Switch Cable. in frame x, cage y.	Cable Fail	Replace the cable connected to the port or switch in the FRU list
BB20F203	1606 : The Line Continuity Diagnostic Test has found a problem with a Switch Planar in frame x, cage y.	Adapter Fail	Replace the first Switch in the FRU list (location code U7045.SW4.SerialNumber-P1)
BB20F301	1608 : The Wrap Diagnostic Test has found a problem with a Switch Cable in frame x, cage y.	Cable Fail	Replace the cable connected to the port or switch in the FRU list
BB20F303	1610 : The Wrap Diagnostic Test has found a problem with a Switch Planar in frame x, cage y.	Switch Fail	Replace the first Switch in the FRU list (location code U7045.SW4.SerialNumber-P1)
BB302034	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Recv unconsumed route	Call your next level of support
BB303034	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Recv unconsumed route	Call your next level of support
BB30400E	1209 : Adapter Reported an Internal Error	Arbiter hang	Replace the first SNI in the FRU list.

Table 53. BBXXXXXX FRU identification codes (continued)

Error code	Message in SFP	Error Description	Action
BB306010	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	TOD Master Rec Error	Call your next level of support
BB306011	1209 : Adapter Reported an Internal Error	No 75 MHz Oscillator	Replace the first SNI in the FRU list.
BB306012	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	TOD Invalid Error	Call your next level of support
BB30601A	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	First Byte Error	Call your next level of support
BB30601B	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Invalid Control Error	Call your next level of support
BB30601E	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Non-Service Packet on Virtual Lane 7	Call your next level of support
BB306024	1209 : Adapter Reported an Internal Error	Path Table (Non-Split Mode) Route0 Parity Error	Replace the first SNI in the FRU list.
BB306025	1209 : Adapter Reported an Internal Error	Path Table (Non-Split Mode) Route1 Parity Error	Replace the first SNI in the FRU list.
BB306026	1209 : Adapter Reported an Internal Error	Path Table (Non-Split Mode) Route2 Parity Error	Replace the first SNI in the FRU list.
BB306027	1209 : Adapter Reported an Internal Error	Path Table (Non-Split Mode) Route3 Parity Error	Replace the first SNI in the FRU list.
BB30602B	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Path Table (Non-Split Mode) No Path	Call your next level of support
BB30602C	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Path Table (Non-Split Mode) Bad Route0	Call your next level of support

Table 53. BBXXXXXX FRU identification codes (continued)

Error code	Message in SFP	Error Description	Action
BB30602D	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Path Table (Non-Split Mode) Bad Route1	Call your next level of support
BB30602E	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Path Table (Non-Split Mode) Bad Route2	Call your next level of support
BB30602F	1400 : Unknown Network Problem. Record the first 8 characters of the reference code in the FRU list, then call your next level of support.	Path Table (Non-Split Mode) Bad Route3	Call your next level of support
BB3060E0	1209 : Adapter Reported an Internal Error	No 75 MHz oscillator (redrive)	Replace the first SNI in the FRU list.
BB30F000	1303 : Suspect a faulty adapter link driver chip because of a combination of errors	suspect_AdpLDC	1. Replace the first SNI in the FRU list. 2. Go to “Procedure 5” on page 270
BB30F001	1304 : Suspect faulty adapter card, because of a combination of errors	suspect_adpcard	1. Replace the first SNI in the FRU list. 2. Go to “Procedure 5” on page 270
BB30F0F3	1506 : VPD Problem on an Adapter	Adapter VPD unavailable	Replace the first SNI in the FRU list.
BB30F0F4	1506 : VPD Problem on an Adapter	Invalid Adapter VPD checksum	Replace the first SNI in the FRU list.
BB402028	1200 : Adapter Reported an Error on an External Link	Bad Echo received (no head or tail signal)	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB403028	1200 : Adapter Reported an Error on an External Link	Bad Echo received (no head or tail signal)	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB40D000	1200 : Adapter Reported an Error on an External Link	LCRC Error	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB40D001	1200 : Adapter Reported an Error on an External Link	LCRC Threshold Error	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB40D002	1200 : Adapter Reported an Error on an External Link	ECRC Error	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB40D003	1200 : Adapter Reported an Error on an External Link	ECRC Threshold Error	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB40D004	1200 : Adapter Reported an Error on an External Link	Receive Buffer Overflow	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB40D005	1209 : Adapter Reported an Internal Error	Receive Buffer Underflow	Replace the first SNI in the FRU list.
BB40D006	1200 : Adapter Reported an Error on an External Link	TSEQ Number Error	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269

Table 53. BBXXXXXX FRU identification codes (continued)

Error code	Message in SFP	Error Description	Action
BB40D007	1001 : A Link Synchronization Error was Reported on an External Link. This will suppress the reporting of other associated link errors.	Link Sync Fail	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB40D009	1200 : Adapter Reported an Error on an External Link	Missing Header Error	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB40D00A	1200 : Adapter Reported an Error on an External Link	Missing Tail Flit	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB40D00D	1200 : Adapter Reported an Error on an External Link	Decode Error	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB40D00E	1200 : Adapter Reported an Error on an External Link	Invalid VL Error	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB40D00F	1200 : Adapter Reported an Error on an External Link	Missing RSEQ	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB40D010	1200 : Adapter Reported an Error on an External Link	Retry Count Threshold	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB40D011	1200 : Adapter Reported an Error on an External Link	RSEQ Number Errors	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB40D014	1200 : Adapter Reported an Error on an External Link	Credit Count Overflow	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB40D01A	1200 : Adapter Reported an Error on an External Link	Hang Detected Error 0	1. Check for a loose or cocked cable 2. Go to “Procedure 3” on page 269
BB40D020	1205 : Adapter Reported an Error on an Internal Link.	LCRC Error	Replace the first SNI in the FRU list.
BB40D021	1205 : Adapter Reported an Error on an Internal Link.	LCRC Threshold Error	Replace the first SNI in the FRU list.
BB40D022	1205 : Adapter Reported an Error on an Internal Link.	ECRC Error	Replace the first SNI in the FRU list.
BB40D023	1205 : Adapter Reported an Error on an Internal Link.	ECRC Threshold Error	Replace the first SNI in the FRU list.
BB40D024	1205 : Adapter Reported an Error on an Internal Link.	Receive Buffer Overflow	Replace the first SNI in the FRU list.
BB40D025	1209 : Adapter Reported an Internal Error	Receive Buffer Underflow	Replace the first SNI in the FRU list.
BB40D026	1205 : Adapter Reported an Error on an Internal Link.	TSEQ Number Error	Replace the first SNI in the FRU list.
BB40D027	1002 : A Link Synchronization Error was Reported on an Internal Link. This will suppress the reporting of other associated link errors.	Link Sync Fail	Replace the first FRU in the FRU list.
BB40D029	1205 : Adapter Reported an Error on an Internal Link.	Missing Header Error	Replace the first SNI in the FRU list.

Table 53. BBXXXXXX FRU identification codes (continued)

Error code	Message in SFP	Error Description	Action
BB40D02A	1205 : Adapter Reported an Error on an Internal Link.	Missing Tail Flit	Replace the first SNI in the FRU list.
BB40D02D	1205 : Adapter Reported an Error on an Internal Link.	Decode Error	Replace the first SNI in the FRU list.
BB40D02E	1205 : Adapter Reported an Error on an Internal Link.	Invalid VL Error	Replace the first SNI in the FRU list.
BB40D02F	1205 : Adapter Reported an Error on an Internal Link.	Missing RSEQ	Replace the first SNI in the FRU list.
BB40D030	1205 : Adapter Reported an Error on an Internal Link.	Retry Count Threshold	Replace the first SNI in the FRU list.
BB40D031	1205 : Adapter Reported an Error on an Internal Link.	RSEQ Number Errors	Replace the first SNI in the FRU list.
BB40D034	1205 : Adapter Reported an Error on an Internal Link.	Credit Count Overflow	Replace the first SNI in the FRU list.
BB40D03A	1205 : Adapter Reported an Error on an Internal Link.	Hang Detected Error 1	Replace the first SNI in the FRU list.
BB40F104	1603 : The Link Verify Diagnostic Test has found a problem with an SNI in frame x, cage y.	Adapter Fail	Replace the first SNI in the FRU list (location code = Ufeaturecode.001.SerialNumber-Px-Cy-Tz). **Note:** The -Cy characters identify the SNI card and the -Tz characters identify the SNI port.
BB40F204	1607 : The Line Continuity Diagnostic Test has found a problem with an SNI in frame x, cage y.	Adapter Fail	Replace the first SNI in the FRU list (location code = Ufeaturecode.001.SerialNumber-Px-Cy-Tz). **Note:** The -Cy characters identify the SNI card and the -Tz characters identify the SNI port.
BB40F304	1611 : The Wrap Diagnostic Test has found a problem with an SNI in frame x, cage y.	Adapter Fail	Replace the first SNI in the FRU list (location code = Ufeaturecode.001.SerialNumber-Px-Cy-Tz). **Note:** The -Cy characters identify the SNI card and the -Tz characters identify the SNI port.
BB500063	1502 : Problem communicating with Switch Riser Card Service Path	Error reading Plug detect I2C latch. Could be a wrap card. Not sure if card is plugged.	1. Check for a loose or cocked SPC card 2. Go to "Procedure 6" on page 270
BB500083	1501 : Invalid Switch Riser Card	Invalid riser (SPC) card ID. No IC errors indicated.	1. Check for a loose or cocked SPC card 2. Go to "Procedure 6" on page 270
BB5000C0	1502 : Problem communicating with Switch Riser Card Service Path	There is a riser (SPC) card of type 0x00 plugged into the slot but there is an I2C error on reading the plug detect latch on the switch board.	1. Check for a loose or cocked SPC card 2. Go to "Procedure 6" on page 270

Table 53. BBXXXXXX FRU identification codes (continued)

Error code	Message in SFP	Error Description	Action
BB5000C1	1502 : Problem communicating with Switch Riser Card Service Path	There is a riser (SPC) card of type 0x01 plugged into the slot but there is an I2C error on reading the plug detect latch on the switch board.	1. Check for a loose or cocked SPC card 2. Go to "Procedure 6" on page 270
BB5000C2	1502 : Problem communicating with Switch Riser Card Service Path	There is a riser (SPC) card of type 0x02 plugged into the slot but there is an I2C error on reading the plug detect latch on the switch board.	1. Check for a loose or cocked SPC card 2. Go to "Procedure 6" on page 270
BB5000C3	1503 : Problem communicating with Switch Riser Card Service Path and there is an invalid Switch Riser Card installed.	Double error. Error reading riser (SPC) card type from switch board and the riser (SPC) card is reporting an invalid card type.	1. Check for a loose or cocked SPC card 2. Go to "Procedure 6" on page 270
BB50F014	1302 : Suspect a faulty switch riser card because of a combination of errors	suspect_riser	1. Replace the first SPC card in the FRU list. 2. Go to "Procedure 7" on page 271
BB50F0F1	1504: A Driver Chip on a Riser has a bad Self Test Signature	Bad Riser (SPC) Chip Signature	Replace the SPC card in the FRU list
BB50F0F3	1507 : VPD Problem on a Riser	Riser (SPC) VPD unavailable	Replace the first SPC card in the FRU list.
BB50F0F4	1507 : VPD Problem on a Riser	Invalid Riser (SPC) VPD checksum	Replace the first SPC card in the FRU list.
BB50F0FE	1626: A Switch Port Connection Wrap Card was found on a link that is not in diagnostic mode.	Wrap Card installed	1. Remove the SPC Wrap Card from service location designated by the SPC Card in the FRU list. 2. Install a normal SPC Card in the identified service location. 3. Connect any cables that should be connected to the ports on the newly install SPC Card. Verify that the cables are connected at both ends.
BB50F0FF	1624: An optical link has faulty clock recovery	Faulty optical link clock recovery	1. Replace the SPC card (riser) in the FRU list. 2. Replace the Switch in the FRU list.
BB50FEEB	1500 : Previously plugged Switch Riser Card has been unplugged	Riser (SPC) unpluged	1. Check for a loose or cocked SPC card 2. Go to "Procedure 8" on page 271
BB70F0F3	1508 : VPD Problem in a BPA	BPA VPD unavailable	BPA
BB70F0F4	1508 : VPD Problem in a BPA	Invalid BPA VPD checksum	BPA
BB80F0F3	1509 : VPD Problem in a Switch DCA	Switch DCA VPD unavailable	DCA-F

Table 53. BBXXXXXX FRU identification codes (continued)

Error code	Message in SFP	Error Description	Action
BB80F0F4	1509 : VPD Problem in a Switch DCA	Invalid Switch DCA VPD checksum	DCA-F
BB50F102	1601 : The Link Verify Diagnostic Test has found a problem with a Switch Connection Card in frame x, cage y.	Riser (SPC card) Fail	Replace the first Switch Port Connection card in the FRU list (location code = U7045.SW4.SerialNumber-P1-Cx-Ty). **Note:** The -Cx characters identify the SPC card and the -Ty characters identify the SPC port.
BB50F202	1605 : The Line Continuity Diagnostic Test has found a problem with a Switch Connection Card in frame x, cage y.	Riser (SPC card) Fail	Replace the first Switch Port Connection card in the FRU list (location code = U7045.SW4.SerialNumber-P1-Cx-Ty). **Note:** The -Cx characters identify the SPC card and the -Ty characters identify the SPC port.
BB50F302	1609 : The Wrap Diagnostic Test has found a problem with a Switch Connection Card in frame x, cage y.	Riser (SPC card) Fail	Replace the first Switch Port Connection card in the FRU list (location code = U7045.SW4.SerialNumber-P1-Cx-Ty). **Note:** The -Cx characters identify the SPC card and the -Ty characters identify the SPC port.

Use the following location code definitions:

1. Switch planar = U7045.SW4.SerialNumber-P1
2. SPC card (riser) = U7045.SW4.SerialNumber-P1-Cx (Cx identifies the card)
3. SPC port = U7045.SW4.SerialNumber-P1-Cx-Ty (Ty identifies the port)
4. SNI (adapter) = Ufeaturecode.001.SerialNumber-Px-Cy (Cy identifies the SNI)
5. SNI port (adapter port) = Ufeaturecode.001.SerialNumber-Px-Cy-Tz (Cy identifies the SNI, Tz identifies the port)
6. DCA = U7045.SW4.SerialNumber-Ex (x = DCA 1 or 2)
7. Blower = U7045.SW4.SerialNumber-Ex-An (x = DCA 1 or 2, n = blower 1 or 2)
8. Switch cables: Each end of a switch cable is represented as a separate FRU. The FRUs for each cable end are listed sequentially in the FRU list. The first cable end will be designated with `HPSCCAB`, `HPSCCOP`, or `HPSCFIB`. The opposite end of the cable will be designated with `CBLCONT`.
   - The location code for the end of the switch cable connected to the SPC card has the format `U7045.SW4.SerialNumber-P1-Cx-Ty`
   - The location code for the end of the switch cable connected to the SNI has the format `UFeatureCode.001.SerialNumber-Px-Cy-Tz`

FRU identification code service procedures

Attention: **Before** you replace any FRUs related to the error codes listed in Table 53, you **must** perform the diagnostic procedures described in "Running diagnostics from HPSNM" on page 172. Failure to follow those procedures may result in extended service calls. "Before replacing FRUs" on page 239 provides detailed information about this requirement.

Procedure 1

Note: Before you replace any FRUs, you **must** run HPSNM diagnostics on both sides of the failing link (refer to "Running diagnostics from HPSNM" on page 172).

1. Check for loose or cocked cables
2. Run diagnostic wrap tests and replace indicated FRUs
3. If the system is not reporting any FRUs, call the next level of support

Procedure 2

Note: Before you replace any FRUs, you **must** run HPSNM diagnostics on both sides of the failing link (refer to "Running diagnostics from HPSNM" on page 172).

1. Check for loose or cocked cables
2. Run diagnostic wrap tests and replace indicated FRU.
3. If the system is not reporting any FRUs, replace FRUs in the following order:
   a. Replace all cables in the FRU list.
   b. Replace all Switch Connection Cards in the FRU list.

Procedure 3

Note: Before you replace any FRUs, you **must** run HPSNM diagnostics on both sides of the failing link (refer to "Running diagnostics from HPSNM" on page 172).

1. Run diagnostic wrap tests and replace indicated FRU
2. If the system is not reporting any FRUs, replace FRUs in the following order:
   a. Replace the cable listed connected to the port in the FRU list
   b. Replace the first Switch Connection Card in the FRU list
   c. Replace the first SNI in the FRU list
   d. Replace the first Switch in the FRU list

Under certain conditions, the error log may only report the location for one end of a failing connection. To determine the location of the connection that was not reported, use the connection information available in the error log and choose the appropriate action from the following list:

- Check the cable connected at the reported location. If the cable is labeled with information for the opposite end, use that information to locate the unknown connection.
- From the CSM Management Server, open the High Performance Switch Network Manager
  1. Open the appropriate HPSNM panel
     – If the known device is a switch, open the ″Switch Topology View″ panel
     – If the known device is an SNI, open the ″End-Point View″ panel
  2. Highlight the known device
     – Make certain that you also highlight the port requiring service and that the panel displays the port number
     – You may have to select the device several times to display the port information
  3. Click ″Selected-Properties″ on the menu
  4. Select the ″Connected To″ tab
  5. The ″Connected To″ popup should list the device at the other end of the connection
     – If the device is a Switch Port Connection card, retrieve the port information by going to the Switch Topology View and clicking on the SPC card described in the ″Connected To″ popup
     – If the device is an SNI, retrieve the port information by going to the End-Point View and clicking on the SNI described in the ″Connected To″ popup
- If you are not able to determine the location for the unknown connection from either HPSNM or the label attached to the cable, refer to the cable planning documentation to determine the intended port location for the cable connection.
- If HPSNM, the cable label, and the planning information do not identify the connection location, you will have to trace the cable from the known location to the unknown connection port

Procedure 4

Note: Before you replace any FRUs, you **must** run HPSNM diagnostics on both sides of the failing link (refer to "Running diagnostics from HPSNM" on page 172).

1. Replace the cable connected to the port named in the FRU list

2. Replace the first Switch Connection Card in the FRU list
3. Replace the first SNI in the FRU list

Under certain conditions, the error log may only report the location for one end of a failing connection. To determine the location of the connection that was not reported, use the connection information available in the error log and choose the appropriate action from the following list:

- Check the cable connected at the reported location. If the cable is labeled with information for the opposite end, use that information to locate the unknown connection.
- From the CSM Management Server, open the High Performance Switch Network Manager
  1. Open the appropriate HPSNM panel
     - If the known device is a switch, go to the ″Switch Topology View″
     - If the known device is an SNI, go to the ″End-Point View″
  2. Highlight the known device
     - Make certain that you also highlight the port requiring service and that the panel displays the port number
     - You may have to select the device several times to display the port information
  3. Click ″Selected-Properties″ on the menu
  4. Select the ″Connected To″ tab
  5. The ″Connected To″ popup should list the device at the other end of the connection
     - If the device is a Switch Port Connection card, retrieve the port information by going to the Switch Topology View and clicking on the SPC card described in the ″Connected To″ popup
     - If the device is an SNI, retrieve the port information by going to the End-Point View and clicking on the SNI described in the ″Connected To″ popup
- If you are not able to determine the location for the unknown connection from either HPSNM or the label attached to the cable, refer to the cable planning documentation to determine the intended port location for the cable connection.
- If HPSNM, the cable label, and the planning information do not identify the connection location, you will have to trace the cable from the known location to the unknown connection port

Procedure 5

Note: Before you replace any FRUs, you **must** run HPSNM diagnostics on both sides of the failing link (refer to “Running diagnostics from HPSNM” on page 172).

1. Check for loose or cocked cables
2. Run diagnostic wrap tests and replaced indicated FRU
3. If the system is not reporting any FRUs, replace FRUs in the following order:
   a. Replace all cables in the FRU list
   b. Replace all Switch Connection Cards in the FRU list

Procedure 6

Note: Before you replace any FRUs, you **must** run HPSNM diagnostics on both sides of the failing link (refer to “Running diagnostics from HPSNM” on page 172).

1. Replace the first Switch Connection Card in the FRU list
2. Run diagnostic wrap tests and replaced indicated FRU
3. If the system is not reporting any FRUs, replace FRUs in the following order:
   a. Replace DCA on switch
   b. Replace switch planar
   c. If problem still present, call next level of support

Procedure 7

Note: Before you replace any FRUs, you **must** run HPSNM diagnostics on both sides of the failing link (refer to "Running diagnostics from HPSNM" on page 172).

1. Check for loose or cocked cables
2. Run diagnostic wrap tests and replace indicated FRUs
3. If the system is not reporting any FRUs, replace FRUs in the following order:
   a. Replace all cables in the FRU list
   b. Replace the first switch in the FRU list

Procedure 8

Note: Before you replace any FRUs, you **must** run HPSNM diagnostics on both sides of the failing link (refer to "Running diagnostics from HPSNM" on page 172).

1. Run diagnostic wrap tests and replaced indicated FRU
2. If the system is not reporting any FRUs, replace FRUs in the following order:
   a. Replace the first Switch Connection Card in the FRU list
   b. Replace the cable listed connected to the port in the FRU list

Network status codes on HPSNM

Table 54 lists the network status reported on by High Performance Switch Network Manager. Each report lists two pieces of information; the status category and the status description. For example, if you receive `Svc reqd:Miswired` as a report, the status category is "Service required" and the status description informs you that there is a miswire. In addition to the report description, Table 54 also provides the associated service action for each report.

Attention: HPS network components have built-in redundancies that provide high availability service. Because of these design features, a link may appear operational even though it has a serviceable event posted against it. Under these conditions, you should perform the service actions for the reported event. Although you may be able to defer maintenance, the network may experience degraded performance until the service actions are complete.

Table 54. Network status reported on the High Performance Switch Network Manager GUI

Network status	Explanation	Actions
Down:Re-cabled	The cable on this link has been moved	Reboot the server containing the SNI on this link. If this is a switch port, you can determine the SNI by: 1. On the GUI panel, highlight the port 2. From the menu, choose "Selected-Properties" 3. Click the "Connected To" tab 4. Use the physical location ID to determine the location of the server **Note:** The unit location begins with "U" and ends with "-". For IBM @server p5 servers, U7879.001.1234567-P indicates the 7879 server with serial number 1234567.

Table 54. Network status reported on the High Performance Switch Network Manager GUI (continued)

Network status	Explanation	Actions
Down:Checkstop	A checkstop has occurred in a server connected to this link. If there are multiple SNI ports in the checkstopped server, you should see multiple links with this same status. **Note:** If the system reports the problem on a switch port, you will need to determine which server has checkstopped.	If the problem is reported on an **SNI** port: 1. Open Service Focal Point on the HMC controlling the checkstopped server 2. Review the error logs to find the problem 3. Make the suggested repairs If the problem is reported on a **switch** port: 1. On the GUI panel, highlight the switch port 2. From the menu, choose ″Selected-Properties″ 3. Click the ″Connected To″ tab 4. Record the frame, cage, and physical location of the SNI connected to the switch port 5. Refer to the cluster planning information to determine which HMC manages the server with that SNI 6. Open Service Focal Point on the HMC controlling the checkstopped server 7. Review the error logs to find the problem 8. Make the suggested repairs
Down:SNI Not Operational	This SNI is present but not functional	The SNI link is present but it is not functional. An OS class error associated with the SNI link should be reported to SFP on the HMC controlling the server in which this SNI is installed. Search for the matching physical location code in SFP.
Down:No Signal	The signal indicating that a cable is plugged into this port is not present. This will not be part of the rolled up status, ″Mixed.″	• If a cable should not be connected to this port, then there is no action to take • If a cable should be connected to this port, refer to “Service actions for ″Down:No Signal″” on page 274

Down:No SPCC detected	A Switch Port Connection Card (riser) is not installed	1. Check the planning information and verify that an SPC card was supposed to be installed at the reported location
		  • If an SPC card was not supposed to have been installed, this fault is normal and may be ignored for the reported location
		2. Visually inspect the reported location:
		  • If a card is in place, reseat the card
		  • If a card is missing, determine the source of the error and fix
		3. After reseating or installing the card, verify that the LEDs come on or flash
		  • If the LEDs remain off, replace the SPC card

Table 54. Network status reported on the High Performance Switch Network Manager GUI (continued)

Network status	Explanation	Actions
Down:Not operational	The link is not timed and is therefore not operational. This can be caused by: • A missing cable • A faulty cable • A faulty link **Note:** If a cable is not supposed to be connected at the reported location, this fault is normal and may be ignored for the reported location	Refer to "Service actions for ″Down:Not operational″" on page 276
Down:Powered Off	Switch is powered off	This device is powered off. Power it on, if you wish to use it.
Down:System event reported	Software failure while trying to unfence a port	There was a software failure associated with accessing this port. Call the next level of support.
Down:Unavailable	The links are associated with an SNI (adapter) that is present but not functional.	The SNI link is present but it is not functional. An OS class error associated with the SNI link should be reported to SFP. Search for the matching Umt.m.s-Px-Cy location code in SFP.
Svc reqd:Error reported	Unexpected value in frame, cage, or chip field of location id (reg 34) - hardware problem (chip) or BPC/DCA problem (frame or cage)	An error has been logged from this device. Check SFP for an Open event associated with this device or a device connected to it. Use the properties panel to determine any connected devices. If there are no events found in SFP, and this status is on switch ports 4 through 7, replace the planar. Otherwise, run diagnostics on the link.
Svc reqd:Miswired	Switch-to-switch miswire, or SNI miswire	This device is not cabled correctly. Review the switch cable planning data for this SPC card. • If the cable connections on the SPC card do not match the planning data, re-cable the ports as needed. After this service action, refresh the GUI, verify the fix, and continue • If the cable connections match the planning data, then there was a mistake in the planning data that will need to be corrected
Unknown:Comm port down	Cannot communicate over the cluster service network	Check the Ethernet connection to the cluster service network: • For switches, check the connection to the BPA and the UPIC cables to the DCAs • For SNIs, check the connection to the Service Processor **Note:** If there are any Ethernet, routers, hubs, or switches used in the cluster service network, make certain that you check each of those connections.
Unknown:Diagnosing ...	Diagnostics are being run on this link	The system is running diagnostics on this link

Table 54. Network status reported on the High Performance Switch Network Manager GUI (continued)

Network status	Explanation	Actions
Unknown:Not operational	The status of an offboard link indicates a problem caused by a missing cable **Note:** Both ends of the cable may report the same condition.	Refer to "Service actions for ″Unknown:Not Operational″" on page 279
Unknown:Undetermined	fnmd has not yet begun to explore this link	This link has yet to be explored by the Network Manager. **Note:** This state is temporary. 1. Wait several minutes 2. Refresh the GUI 3. The link should either become operational or go into an error state 4. If the Unknown:Undetermined status persists, call the next level of support
Unknown:Working ...	Switch is powered; exploration in progress	Link exploration is in progress. **Note:** This state is temporary. 1. Wait several minutes 2. Refresh the GUI • In a large cluster, link exploration may take several minutes or longer
Unknown:Wrap installed	Wrap plug is installed	A wrap plug is installed. 1. Check the port 2. If a wrap plug was left in place after diagnostics were performed, remove the wrap plug 3. Attach the appropriate cable to the port • If the planned configuration does not specify a cable for this port, install the port cover if required for dust or EMC compliance
Up:Operational	Both sides of link are timed and ready to use.	The link is operational and does not require service.
Working ...	Link is timed; other side not yet explored	The link is still waiting for HPSNM exploration. **Note:** This state is temporary. 1. Wait several minutes 2. Refresh the GUI 3. If the Working status persists, call the next level of support

Service actions for ″Down:No Signal″

Use this procedure if you observe ″Down:No Signal″ status on a port that should have a cable attached:

1. Refer to the cable planning information and identify the port that was supposed to be connected to the port with the service problem
2. Check that a cable is plugged into the identified port and that the opposite end of that cable is properly attached to the port on the other side of the link
   - If the two ports are not properly connected, make the required connections or fix the miswire
3. If the links are properly cabled, check the green LEDs on the ports:
   - If the green LED on **one** of the ports **is not lit** and:

- If the port without the green LED is on an **SPC** card, check the switch power:
  - If the switch is not powered on:
    a. Power the switch on
    b. Refresh the GUI
       - If the GUI displays Up:Operational, return to the diagnostic procedure that brought you here and complete the service action
       - If the GUI displays any status other than Up:Operational, restart the diagnostic procedures using the new status
  - If the switch is powered on:
    a. Replace the SPC card
    b. Refresh the GUI
       - If the GUI displays Up:Operational, return to the diagnostic procedure that brought you here and complete the service action
       - If the GUI displays any status other than Up:Operational, restart the diagnostic procedures using the new status
- If the port without the green LED is on an **SNI**:
  - Verify that the server with the SNI is IPLd, IPL the server if needed and recheck the status when the system is ready
  - If the server is IPLd, check to see if the SNI is set to ″Repeat GARD″ (using ASM on the service processor)
    - If the SNI is set to ″Repeat GARD″
      a. Open SFP on the HMC controlling the server
      b. Search for a serviceable event against this SNI
         - If there is a serviceable event against this SNI, perform the requested service actions
         - If SFP on the controlling HMC does not list a serviceable event against this SNI, call the next level of support
    - If the SNI is not set to ″Repeat GARD,″ replace the SNI card

- If the green LED on **both** of the ports **are not lit** and:
  - If one of the ports is on an **SPC** card and the other port is on an **SNI**:
    a. Diagnose the **SPC** card by checking the switch power
       - If the switch is not powered on:
         1) Power the switch on
         2) Refresh the GUI
            - If the GUI displays Up:Operational, return to the diagnostic procedure that brought you here and complete the service action
            - If the GUI displays any status other than Up:Operational, restart the diagnostic procedures using the new status
       - If the switch is powered on:
         1) Replace the SPC card
         2) Refresh the GUI
            - If the GUI displays Up:Operational, return to the diagnostic procedure that brought you here and complete the service action
            - If the GUI displays any status other than Up:Operational, restart the diagnostic procedures using the new status
    b. Diagnose the **SNI**
       - Verify that the server with the SNI is IPLd, IPL the server if needed and recheck the status when the system is ready
       - If the server is IPLd, check to see if the SNI is set to ″Repeat GARD″ (using ASM on the service processor)
         - If the SNI is set to ″Repeat GARD″
           1) Open SFP on the HMC controlling the server
           2) Search for a serviceable event against this SNI
              - If there is a serviceable event against this SNI, perform the requested service actions
              - If SFP on the controlling HMC does not list a serviceable events against this SNI, call the next level of support

        - If the SNI is not set to ″Repeat GARD,″ replace the SNI card
  - If both ports are on **SPC** cards (switch-to-switch connections):
    a. Check the switch power on both switches
       - If one of the switches is not powered on:
         1) Power the switch on
         2) Refresh the GUI
            - If the GUI displays Up:Operational, return to the diagnostic procedure that brought you here and complete the service action
            - If the GUI displays any status other than Up:Operational, restart the diagnostic procedures using the new status
       - If both switches are powered on:
         1) Replace one of the associated SPC cards
         2) Recheck the port LEDs, if one or both LEDs are still off, replace the other SPC card
         3) Recheck the port LEDs
            - If both of the port LEDs are lit, return to the diagnostic procedure that brought you here and complete the service action
            - If one or both LEDs are still off, call the next level of support
- If both ports have a **flashing** green LED, perform the following actions:
  a. Check for loose connections
     - If needed tighten the cable connectors and recheck the LEDs
       - If both of the port LEDs are lit and not flashing, return to the diagnostic procedure that brought you here and complete the service action
       - If one or both LEDs are still flashing, continue with the next step
  b. Check for bent pins on the cable ends
     - Replace the cable if needed and the recheck the LEDs
       - If both of the port LEDs are lit and not flashing, return to the diagnostic procedure that brought you here and complete the service action
       - If one or both LEDs are still flashing, continue with the next step
  c. If the problem was not in the connectors or the cable:
     - If this is a switch-to-switch connection
       1) Replace one of the associated SPC cards
       2) Recheck the port LEDs:
          - If both of the port LEDs are lit and not flashing, return to the diagnostic procedure that brought you here and complete the service action
          - If one or both LEDs are still flashing, replace the other SPC card
       3) Recheck the port LEDs
          - If both of the port LEDs are lit and not flashing, return to the diagnostic procedure that brought you here and complete the service action
          - If one or both LEDs are still flashing, call the next level of support
     - If this is a switch-to-server connection
       1) Replace the SPC card
       2) Recheck the port LEDs
          - If both of the port LEDs are lit and not flashing, return to the diagnostic procedure that brought you here and complete the service action
          - If one or both LEDs are still flashing, replace the associated SNI
       3) Recheck the port LEDs
          - If both of the port LEDs are lit and not flashing, return to the diagnostic procedure that brought you here and complete the service action
          - If one or both LEDs are still flashing, call the next level of support

Service actions for ″Down:Not operational″

The following information block describes the internal structure of the switch planar. This background information may help you perform the service actions for a network with a reported status of ″Down:Not operational.″

Switch architecture and switch chip ports

The switch chip ports referred to in this procedure are the switch planar communication ports for the switch chips. Each switch planar has eight switch chips and each switch chip has eight of these internal communication ports. Of the eight ports assigned to each switch chip, switch chip ports 0, 1, 2, and 3 are connected to the external ports on the switch planar. Since the switch chip ports with these numbers are associated with external links, they are sometimes referred to as offboard links. Figure 69 on page 340 illustrates the relationship between the following components:

- Switch chip ports 0, 1, 2, and 3
- Switch chips 0, 1, 2, 3, 4, 5, 6, and 7
- Switch planar slots 1 through 16
- The external ports on the switch planar

Note: Figure 69 does not illustrate switch chip ports 4, 5, 6, and 7. Switch chip ports with these numbers are used for communication between each of the eight switch chips. Since switch chip ports 4, 5, 6, and 7 are associated with internal links, they are sometimes referred to as onboard links. If you isolate a failure to one of these onboard links, the switch planar may have to be replaced.

Actions for switch chip ports 4, 5, 6, and 7

High Performance Switch Network Manager reported ″Down:Not operational″ as a network status. If HPSNM reported the status on switch chip port 4, 5, 6, or 7, replace the switch planar at the next maintenance opportunity.

Note: A single faulty port 4, 5, 6, or 7 does not seriously affect application performance, but can only be fixed by replacing a switch planar.

Actions for SNIs or switch chip ports 0, 1, 2, and 3

High Performance Switch Network Manager reported ″Down:Not operational″ as a network status. If HPSNM reported the status on switch chip port 0, 1, 2, or 3, or on an SNI:

1. Verify switch cables for the listed Switch Port Connection card (riser) or SNI
   - If a cable is not supposed to be connected to this port, this status is normal and the status message may be ignored on this port
   - If a cable is supposed to be connected to this port and the cable is not there, connect the cable
     a. Make sure to connect the other end to the appropriate port
     b. Verify that the green LEDs on any SPC card or SNI and the associated connectors are solid green
        – If the LEDs are not solid green, reseat the cable
     c. Refresh the GUI to check the new status
   - If a cable is connected to this port, check the LED on that port
     – If that LED is off, check LEDs for all cabled ports on that switch
       - If all LEDs are off:
         a. Refresh the GUI
         b. Check the GUI to see if switch power is on
            - If switch power is on, call the next level of support
            - If switch power is off, power up the switch and verify that the problem has been fixed
       - If the initial LED is the only LED that is off:
         a. Replace the SPC card
         b. If one or both LEDs are still off, the problem may be in the switch planar
         c. Before you replace the planar, call the next level of support and review the diagnostic procedure used in this instance
     – If the LED is on or flashing, check to see if the cable is properly seated
       - If the cable is not properly seated, reseat the cable and refresh the GUI for new status

- If the cable appears to be seated properly, remove the cable at both ends and check for bent pins

2. Verify pin condition on both ends of the switch cable
   a. If there are bent pins on the switch cable, check the associated Switch Port Connection card (riser) or SNI for damage caused by the bent pins
      - If the SPC card or SNI is damaged, replace both the cable and the associated SPC card or SNI
      - If the cable is the only damaged component, replace the cable
   b. After replacing components, verify that the green LEDs are lit and solid on the SPC cards or SNI ports on both ends of the cable.

      Note: Replacing an SPC card or SNI affects multiple cables. You must verify the green LEDs on both ends of all cables associated with the replaced component. You must also verify the port LEDs on all other components affected by the repair.
   c. Refresh the GUI to check the new status reported on all ports associated with the cables connected to the replaced SPC card or SNI
3. Verify condition of switch port components
   - If the switch cable does not have any bent pins, check the SPC card or SNI for physical damage:
     a. If the component is damaged, replace the SPC card or SNI

        Note: Replacing an SPC card or SNI will cause another port to go down. Verify that the green LEDs are solidly lit on all affected components.
     b. Refresh the GUI to check the new status

        Note: Check all ports connected to both ends of all cables that were pulled to replace the SPC card or SNI
   - If the SPC card or SNI is not damaged and the switch cable does not have any bent pins, reseat both ends of the switch cable and check the green LEDs on the ports at each end of the cable:
     – If the green LEDs go solid, refresh the GUI and check status
     – If the green LEDs are still flashing, replace the cable
4. Replace faulty FRUs
   - If the port indicating ″Down:Not Operational″ is on an SPC card and the port on the other end of the cable is on an SNI:
     a. Replace the SPC card
     b. Verify that the green LED comes on solidly
     c. Refresh the GUI and recheck status
     d. If the green LED does not come on solidly or the GUI status still indicates ″Down:Not Operational,″ replace the SNI on the other end of the cable
     e. Verify that the green LED comes on solidly
     f. Refresh the GUI and recheck status
   - If the port indicating ″Down:Not Operational″ is on an SPC card and the port on the other end of the cable is also on an SPC card:
     a. Replace the SPC card with the port indicating ″Down:Not Operational″
     b. Verify that the green LED comes on solidly
     c. Refresh the GUI and recheck status
     d. If the green LED does not come on solidly or the GUI status still indicates ″Down:Not Operational,″ replace the SPC card at the other end of the cable
     e. Verify that the green LED comes on solidly
     f. Refresh the GUI and recheck status
   - If the port indicating ″Down:Not Operational″ is on an SNI:
     a. Replace the SPC card on the opposite end of the cable from the SNI
     b. Verify that the green LED comes on solidly
     c. Refresh the GUI and recheck status
     d. If the green LED does not come on solidly or the GUI status still indicates ″Down:Not Operational,″ replace the SNI with the port indicating ″Down:Not Operational″

Service actions for ″Unknown:Not Operational″

The status of an offboard link indicates a problem caused by a missing cable. However, with this status, it is likely that another problem prevents the two sides from exchanging information. As a result, the ″Connected-To″ properties for the link are blank. It is also possible that the link on one end of the cable is powered off which makes it appear to the other link that a cable is not attached.

Note: Both ends of the cable may report the same condition.

Use this procedure if you observe ″Unknown:Not Operational″ as a link status indicating a missing cable:

1. If you don't know if a cable is attached to this link, wait several minutes and refresh the GUI
   - Refresh the GUI up to 3 times
   - Wait several minutes between refresh attempts
2. When the GUI refreshes, check status:
   - If the status changes, refer to the new status and perform the indicated procedure
   - If the status does not change, you must determine if the status is valid for this link. To make this determination:
     a. Either go to the link and look for a cable, or refer to your cable planning information to determine if a cable should be attached to this link
     b. If a cable does not exist, and there should be one there, attach a cable to both ends of the link
     c. If a cable does exist:
        1) Determine if the device on the other side of the cable is powered off. If it is, then this is a valid state. You should now determine if the other side should be powered off.
           a) If the device on the other side of the cable should be powered off, then no action is required
           b) If the device on the other side of the cable should NOT be powered off, power that device on
        2) If the other side is powered on, you have essentially determined that this link is ″Down:Not Operational″ therefore, perform the "Service actions for ″Down:Not operational″" on page 276

Appendix B. Physical and environmental specifications

Before you receive your HPS Cluster 1600 system, you need to determine the route you will use to move the system from the delivery location to the installation site. You must assess any potential route for the following:

- Make certain that all doorways, elevators, and corridors have sufficient height and width clearance to allow movement of the system from the loading dock to the installation site.
- Make certain that all elevators, ramps, and corridors have sufficient load ratings to allow movement of the system without exceeding any weight limitations encountered along the route from the loading dock to the installation site.
- If any there are any turns, bends or obstructions in the route from the loading dock to the installation site, make certain that their is sufficient clearance to maneuver the system through or around those locations.
- If you determine that there may be, or if you are not certain that there are clearance issues related to moving the system from your loading dock to the installation site, please contact your IBM site planning, marketing, or sales representative.

This appendix contains information about:

- Environmental specifications
- Power requirements and electrical specifications
- Cooling requirements
- Frame size, weight, and floor load specifications
- Floor plan layouts with service clearances

Environmental specifications

Table 55. Environmental specifications

Variable	Operating	Non-Operating	Storage	Shipping
Temperature	10° to 32° C (61° to 90° F)	10° to 43° C (50° to 109° F)	1° to 60° C (34° to 140° F)	-40° to 60° C (-40° to 140° F)
Relative Humidity (Non-condensing)	8 to 80%	8 to 80%	5 to 80%	5 to 100%
Maximum Wet Bulb	23° C (73° F)	27° C (81° F)	29° C (84° F)	29° C (84° F)
Notes: 1. The upper limit of the dry bulb temperature must be de-rated 1 degree C per 189 m (619 ft) above 1295 m (4250 ft).				

Table 56. Acoustic emissions

Description	L_{WAd} Declared A-weighted sound power level (bels)		L_{pAm} Mean A-weighted sound pressure level at the 1 meter bystander positions (decibels)	
	Operating	Idling	Operating	Idling
Single HPS unit in frame with Slimline cover set	7.5 B	7.5 B	59 dB	59 dB
Two HPS units in frame with BPA, Slimline cover set	7.9 B	7.9 B	63 dB	63 dB

Table 56. Acoustic emissions (continued)

Description	L_{WAd} Declared A-weighted sound power level (bels)		L_{pAm} Mean A-weighted sound pressure level at the 1 meter bystander positions (decibels)	
	Operating	**Idling**	**Operating**	**Idling**
Eight HPS units in single frame with BPA, Slimline cover set	8.3 B	8.3 B	66 dB	66 dB
Sixteen HPS units in dual frame with BPA, Slimline cover sets	8.6 B	8.6 B	68 dB	68 dB

Notes:
1. L_{WAd} is the upper limit A-weighted sound power level
2. L_{pAm} is the mean A-weighted sound pressure level measured at the 1-meter bystander positions (1 B = 10 dB)
3. All measurements made in conformance with ISO 7779 and declared in conformance with ISO 9296.

Power specifications

The power requirements for a High Performance Switch frame depends on the type of Switch Port Connection cards used in the switches. Refer to "Power requirements for copper cable Switch Port Connection cards" on page 283 and "Power requirements for fiber optic cable Switch Port Connection cards" on page 283 for specific information.

Table 57 lists the power specifications for the three applicable voltage ranges based on supply line frequency. "Power cords, plugs, and receptacles" on page 284 and "Circuit breaker requirements" on page 285 list the specifications for those power components.

Table 57. Electrical and thermal specifications

Rated ac voltage (3 phase)	Frequency (hertz)	Rated current (Amps per phase)		Maximum inrush current (Amps)	Power, 16 switches (maximum in kW)		Power factor (pf)	Thermal output, 16 switches (maximum kBTU/hr)	
		Up to 12 switches	**More than 12 switches**		**Copper cable**	**Fiber optic cable**		**Copper cable**	**Fiber optic cable**
200 to 240	50 or 60	48	60	163	14.9	17.3	0.99	50.9	59.0
380-415	50 or 60	25	32	163	14.9	17.3	0.97	50.9	59.0
480	50 or 60	20	24	163	14.9	17.3	0.93	50.9	59.0

Note: Inrush currents occur only at initial application of power (very short duration for charging capacitors), no inrush occurs during normal power off-on cycle.

United States National Electric Code requirements
In the US, the system must be installed in accordance with Article 645 of the National Electric Code (NEC).

Canadian Electric Code requirements
In Canada, the system must be installed in accordance with Section 12-020 of the Canadian Electric Code (CEC), Part 1.

Power requirements for switch-only frames

Refer to Table 58 for switch-only frame BPR requirements.

Table 58. BPR requirements for switch-only frames

Number of M/T 7045-SW4 switches in system	Number of BPRs
1 through 6	2
7 through 12	4
13 through 16	6
Note: Switch-only frames using a dual frame configuration require the 100 Amp line cord option when there are eleven to sixteen switched in the frame system (200 - 240 V service).	

Power requirements for copper cable Switch Port Connection cards

Table 59 lists the power requirements for switch-only frames having the listed number of switches configured with copper cable Switch Port Connection cards.

Table 59. Power requirements for systems using copper cable switch port connection cards

Configuration (number of switches)	Power (Watts)
1	1372
2	2272
3	3172
4	4072
5	4972
6	5872
7	6772
8	7672
9	8572
10	9472
11	10372
12	11272
13	12172
14	13072
15	13972
16	14872
Note: Switch-only frames using a dual frame configuration require the 100 Amp line cord option when there are eleven to sixteen switched in the frame system (200 - 240 V service).	

Power requirements for fiber optic cable Switch Port Connection cards

Table 60 lists the power requirements for switch-only frames having the listed number of switches configured with fiber optic cable Switch Port Connection cards.

Table 60. Power requirements for systems using fiber optic cable switch port connection cards

Configuration (number of switches)	Power (Watts)
1	1619
2	2756
3	3892

Table 60. Power requirements for systems using fiber optic cable switch port connection cards (continued)

Configuration (number of switches)	Power (Watts)
4	5028
5	6165
6	7301
7	8438
8	9574
9	10710
10	11847
11	12983
12	14119
13	15256
14	16392
15	17528
16	18665
Note: Switch-only frames using a dual frame configuration require the 100 Amp line cord option when there are eleven to sixteen switched in the frame system (200 - 240 V service).	

Power cords, plugs, and receptacles

Table 61 lists the line cord options available for switch-only frames and the corresponding plug and receptacle specifications.

Table 61. Power cord specifications for switch-only frames

Feature Code	Line Cord Description	Plug Provided	Recommended Receptacle
FC 8677	• 380 V ac - 415 V ac • 8 AWG • 14 foot	Not provided	Not specified
FC 8686	• 240 V ac • 6 AWG (Type W) • 14 foot	IEC-309, 100 Amp	IEC-309, 100 Amp Type 4100R9W (not provided)
FC 8687	• 240 V ac • 6 AWG (Type W) • 6 foot	IEC-309, 100 Amp	IEC-309, 100 Amp Type 4100R9W (not provided)
FC 8688	• 240 V ac • 6 AWG (Type W) • 14 foot	IEC-309, 60 Amp	IEC-309, 60 Amp Type 460R9W (not provided)
FC 8689	• 240 V ac • 6 AWG (Type W) • 6 foot	IEC-309, 60 Amp	IEC-309, 60 Amp Type 460R9W (not provided)
FC 8694	• 240 V ac • 6 AWG • 14 foot	Not provided	Not specified
FC 8697	• 480 V ac • 8 AWG • 14 foot	IEC-309, 30 Amp	Not specified

Table 61. Power cord specifications for switch-only frames (continued)

Feature Code	Line Cord Description	Plug Provided	Recommended Receptacle
FC 8698	• 480 V ac • 8 AWG • 6 foot	IEC-309, 30 Amp	Not specified

Notes:

1. Switch-only frames using a dual frame configuration require the 100 Amp line cord option when there are eleven to sixteen switched in the frame system (200 - 240 V service).
2. Any system provided with electrical connectors are manufactured and shipped with Hubbell plugs.
3. If not provided with the system, the customer must obtain the appropriate plugs and receptacles.
4. A metal backbox with should be used with line cords using IEC-309 plugs. Although inline connectors and nonmetallic backboxes are available and compatible, they are not recommended. A metal backbox provides an added level of protection against miswired phase and ground reversal, and in some cases, it may provide better EMI mitigation. If you choose not to use a metal backbox, check your local codes for specific requirements.

Circuit breaker requirements

Table 62 lists the circuit breaker requirements of the HPS. These ratings are based on a maximum configured system running in 'n-mode'. The Site and Hardware Planning Manual provides additional guidance for calculating the circuit breaker rating for other configurations.

Table 62. Circuit breaker requirements

Voltage (Phase to Phase)	Circuit Breaker Rating[1]
200 V ac - 240 V ac	60 Amp (80 Amp[2])
380 V ac - 415 V ac	32 Amp
480 V ac	30 Amp

Notes:

1. These exact circuit breaker ratings may not be available in all countries. Where the above circuit breaker ratings are not acceptable, use the nearest available rating.
2. 80 Amp circuit breaker recommendation only applies when using **FC 8686** or **FC 8687** line cords.

Switch cooling requirements

Several variables determine the volume of cooling air required for each system:

- The inlet temperature of the cooling air
- Power dissipation requirements based on:
  – The number of switches in each frame
  – The type and number of Switch Port Connection cards used in each switch

Note: Refer to "Power requirements for copper cable Switch Port Connection cards" on page 283 and "Power requirements for fiber optic cable Switch Port Connection cards" on page 283 to determine power dissipation requirements.

Table 63 on page 286 lists cooling references for fully populated switches. To determine the approximate cooling requirements for your configuration:

1. Read down the first column of Table 63 for the number of switches in each frame system
2. Find the cooling chart reference for the type of Switch Port Connection cards used in your configuration (copper cable or fiber optic cable)

3. Using the appropriate reference from Table 63 (designated A through G), refer to Figure 45 on page 287 for the approximate air flow and temperature requirements for that configuration

Note: Table 64 on page 287 defines required airflow rates for specific inlet air temperatures. The airflow values in that table are also cross-referenced to the information in Table 63.

Table 63. Switch cooling requirements based on Switch Port Connection card type and number of switches

Number of switches in frames	**Cooling chart reference**	
	Copper cable Switch Port Connection cards	**Fiber optic cable Switch Port Connection cards**
1	A	A
2	A	A
3	A	A
4	A	B
5	B	B
6	B	C
7	C	C
8	C	C
9	C	D
10	D	D
11	D	E
12	D	E
13	E	F
14	E	F
15	E	F
16	F	G

Notes:
1. Refer to Figure 45 on page 287 for air flow and temperature requirements
2. Refer to Figure 46 on page 289 for the proper floor layout

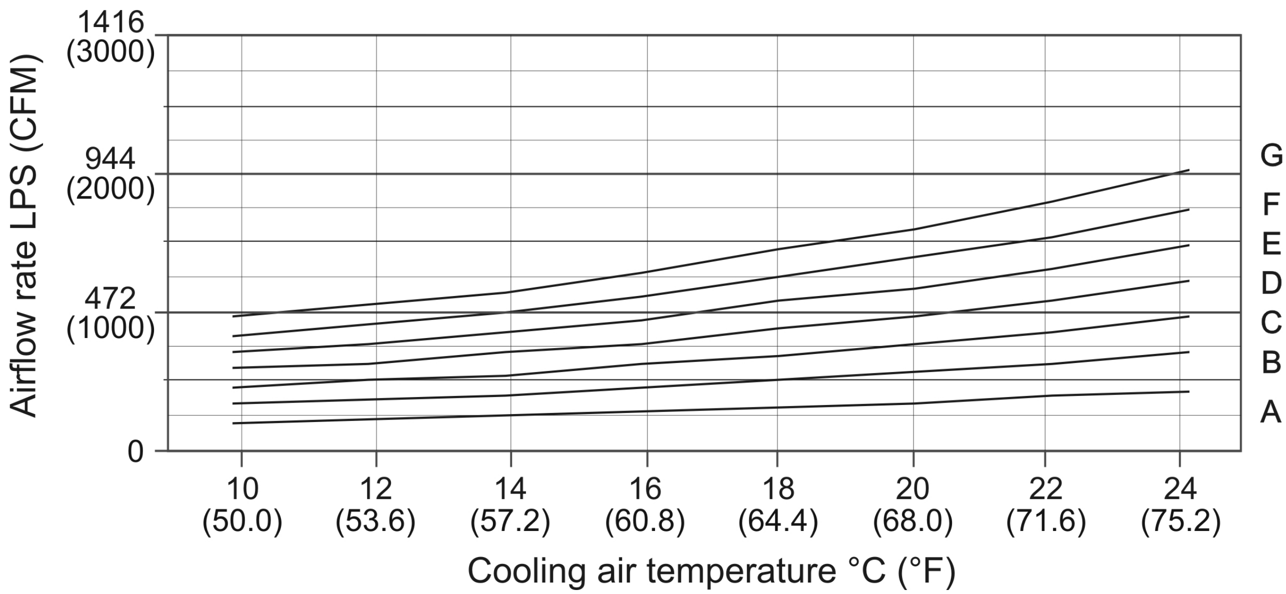


Figure 45. Airflow requirements for system cooling

Table 64. Airflow requirements based on power dissipation and inlet air temperature

Inlet air temperature °C (°F)	Airflow required		Graph range
	Liters per second	**Cubic feet per minute**	
10 (50)	95	201	A
12 (53.6)	104	220	
14 (57.2)	114	242	
16 (60.8)	127	270	
18 (64.4)	144	305	
20 (68.0)	159	337	
22 (71.6)	178	376	
24 (75.2)	201	426	
10 (50)	154	326	B
12 (53.6)	169	357	
14 (57.2)	186	394	
16 (60.8)	207	439	
18 (64.4)	234	496	
20 (68.0)	259	548	
22 (71.6)	288	611	
24 (75.2)	327	692	

Table 64. Airflow requirements based on power dissipation and inlet air temperature (continued)

Inlet air temperature °C (°F)	Airflow required		Graph range
	Liters per second	Cubic feet per minute	
10 (50)	213	452	C
12 (53.6)	233	494	
14 (57.2)	257	545	
16 (60.8)	287	608	
18 (64.4)	324	687	
20 (68.0)	358	759	
22 (71.6)	400®	847	
24 (75.2)	452	958	
10 (50)	272	577	D
12 (53.6)	298	631	
14 (57.2)	328	696	
16 (60.8)	367	777	
18 (64.4)	414	878	
20 (68.0)	457	969	
22 (71.6)	511	1082	
24 (75.2)	578	1224	
10 (50)	331	702	E
12 (53.6)	363	768	
14 (57.2)	400	848	
16 (60.8)	447	946	
18 (64.4)	505	1069	
20 (68.0)	557	1180	
22 (71.6)	622	1317	
24 (75.2)	703	1490	
10 (50)	391	828	F
12 (53.6)	427	905	
14 (57.2)	472	999	
16 (60.8)	526	1114	
18 (64.4)	595	1260	
20 (68.0)	657	1391	
22 (71.6)	733	1552	
24 (75.2)	829	1756	

Table 64. Airflow requirements based on power dissipation and inlet air temperature (continued)

Inlet air temperature °C (°F)	Airflow required		Graph range
	Liters per second	Cubic feet per minute	
10 (50)	450	953	G
12 (53.6)	492	1043	
14 (57.2)	543	1150	
16 (60.8)	606	1283	
18 (64.4)	685	1451	
20 (68.0)	756	1601	
22 (71.6)	843	1787	
24 (75.2)	954	2022	
Note: The approximate exhaust air temperature for each range is 34° C (93° F).			

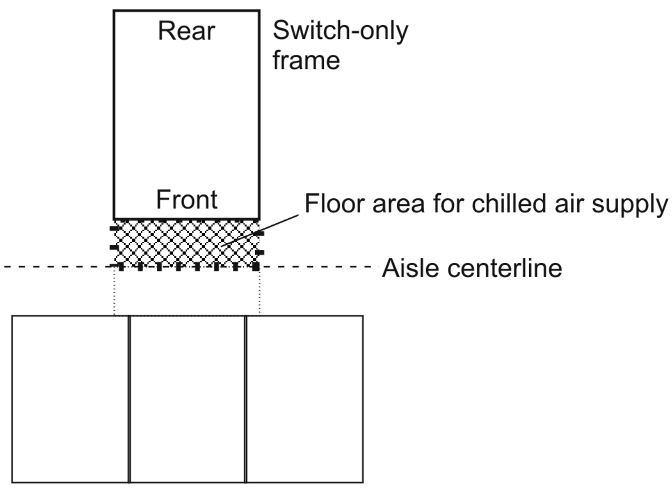


Figure 46. Typical floor plan for proper cooling

Frame specifications

Note: When you are planning your network installation, make certain that you include future requirements for additional server frames, switch-only frames, frame extenders, and auxiliary equipment. Designing your present floor plan with allowances for additional aisles, service areas, and utility access will simplify any future expansion.

Frame dimensions

This section lists the linear dimensions for switch-only frames with doors and Slimline covers installed. Refer to Figure 47 on page 291 for leveling pad and caster locations.

Frame height
2025 mm (79.72 inch)

Frame depth
Frame depth varies with switch cable configuration:

- Frames with 32 or fewer *copper* cable Switch Port Connection cards installed: 1545 mm (60.80 inch)
- Frames with more than 32 *copper* cable Switch Port Connection cards installed: 1951 mm (76.80 inch)
- Frames with *fiber optic* cable Switch Port Connection cards installed: 1545 mm (60.80 inch)

Frame width

Frame width varies with switch configuration:

- Single frame width: 785 mm (30.91 inch)
  - Configurations with IBF pair and up to 6 switches
  - Configurations without IBF pair and up to 8 switches
- Dual frame width: 1575 mm (62.00 inch)
  - Configurations with IBF pair and 7 to 16 switches
  - Configurations without IBF pair and 9 to 16 switches

Frame weights

Refer to "System weights for switch-only frames" on page 291

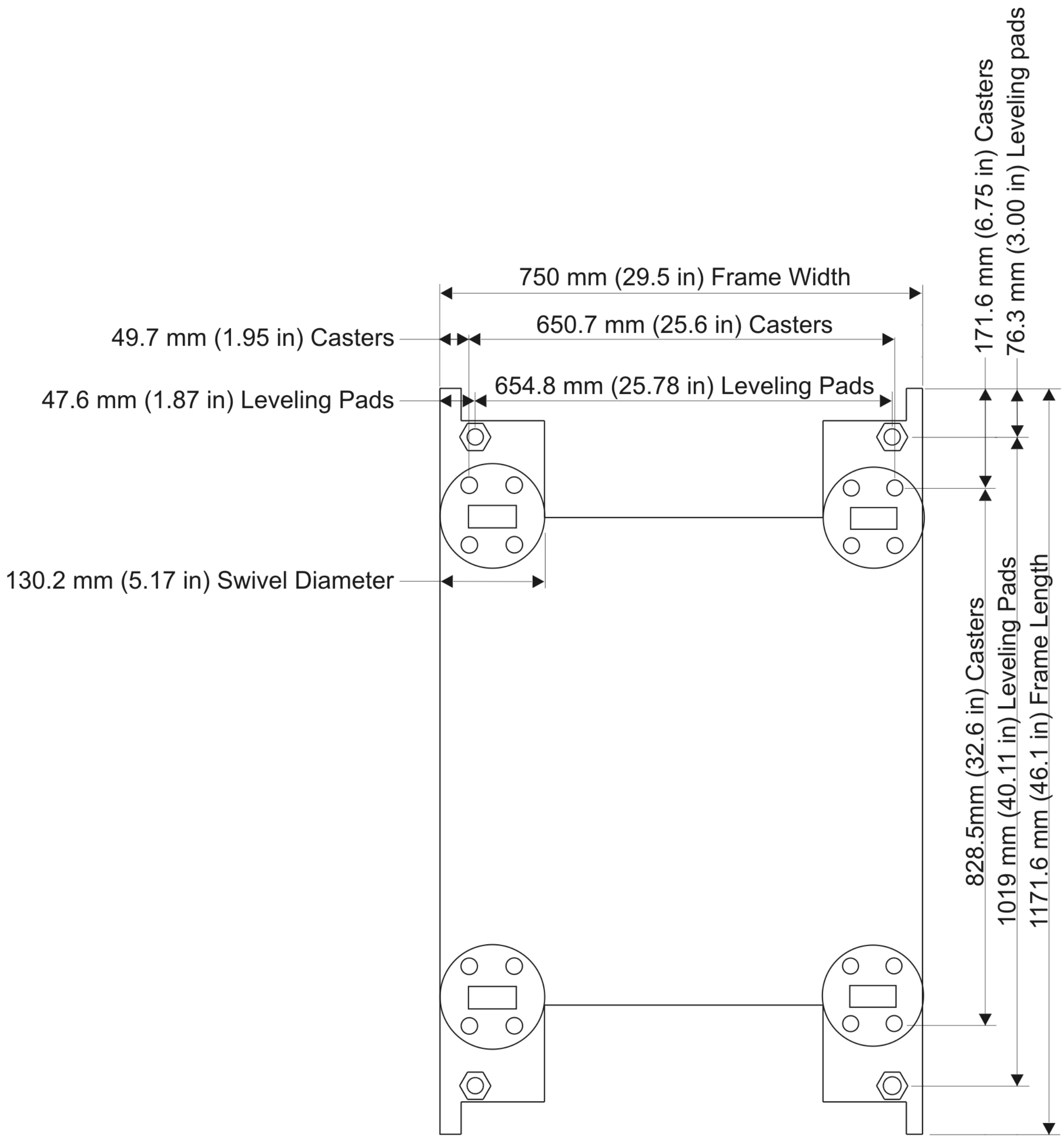


Figure 47. Frame base with caster and leveling pad locations.

Note: This drawing shows the base frame. The dimensions shown do not include extenders or covers.

System weights for switch-only frames

The tables in this section list the system weights for switch-only frames based on the number of switches installed in each frame.

- For frames with copper switch cables refer to Table 65 on page 292 for single frame configuration or Table 66 on page 293 dual frame configurations
- For frames with fiber optic switch cables refer to Table 67 on page 293 for single frame configurations or Table 68 on page 294 for dual frame configurations

System weights for single frame configurations with copper switch cables

The weights listed for the configurations in this section:

- Have all switches fully populated with SPC cards and copper switch cables
- Include switch cable weights
- Frames with one or two switches installed are based on a frame depth of 1544 mm (60.8 inches)
- Frames with three or more switches installed are based on a frame depth of 1951 mm (76.8 inches)
- Frames with more than 32 copper cable Switch Port Connection cards installed are based on a frame depth of 1951 mm (76.8 inches)

Notes:

1. Any frame with more than 32 copper cable Switch Port Connection cards installed requires a 24 inch frame extender.
2. For every copper cable SPC card that gets replaced by a fiber optic cable SPC card, subtract approximately 2.3 kg (5.1 pounds) for the difference in cable weight.
3. For configurations that are completely populated with fiber optic switch cables, refer to, Table 67 on page 293 or Table 68 on page 294

Table 65. System frame weights for single frame systems configured with copper switch cables

Number of switches	Slimline doors, frame with IBF	Slimline doors, frame without IBF	No doors, frame with IBF	No doors, frame without IBF
1	644 kg (1418 pounds)	552 kg (1214 pounds)	618 kg (1360 pounds)	525 kg (1156 pounds)
2	741 kg (1630 pounds)	648 kg (1426 pounds)	715 kg (1572 pounds)	622 kg (1368 pounds)
3	874 kg (1922 pounds)	781 kg (1718 pounds)	847 kg (1864 pounds)	755 kg (1660 pounds)
4	974 kg (2142 pounds)	881 kg (1938 pounds)	947 kg (2084 pounds)	854 kg (1880 pounds)
5	1070 kg (2354 pounds)	977 kg (2150 pounds)	1044 kg (2296 pounds)	951 kg (2092 pounds)
6	1167 kg (2567 pounds)	1074 kg (2363 pounds)	1140 kg (2509 pounds)	1048 kg (2305 pounds)
7	Refer to Table 66 on page 293	1191 kg (2621 pounds)	Refer to Table 66 on page 293	1165 kg (2563 pounds)
8	Refer to Table 66 on page 293	1288 kg (2833 pounds)	Refer to Table 66 on page 293	1261 kg (2775 pounds)

System weights for dual frame configurations with copper switch cables

The weights listed for the configurations in this section:

- Have all switches fully populated with SPC cards and copper switch cables
- Include switch cable weights
- Use frame depth of 1951 mm (76.8 inches)

Notes:

1. Any frame with more than 32 copper cable Switch Port Connection cards installed requires a 24 inch frame extender.
2. For every copper cable SPC card that gets replaced by a fiber optic cable SPC card, subtract approximately 2.3 kg (5.1 pounds) for the difference in cable weight.
3. For configurations that are completely populated with fiber optic switch cables, refer to, Table 67 on page 293 or Table 68 on page 294

Table 66. System frame weights for dual frame systems configured with copper switch cables

Number of switches	Slimline doors, frame with IBF	Slimline doors, frame without IBF	No doors, frame with IBF	No doors, frame without IBF
7	1724 kg (3793 pounds)	Refer to Table 65 on page 292	1671 kg (3677 pounds)	Refer to Table 65 on page 292
8	1820 kg (4005 pounds)	Refer to Table 65 on page 292	1768 kg (3889 pounds)	Refer to Table 65 on page 292
9	1920 kg (4224 pounds)	1735 kg (3816 pounds)	1867 kg (4108 pounds)	1682 kg (3700 pounds)
10	2132 kg (4690 pounds)	1854 kg (4078 pounds)	2079 kg (4574 pounds)	1801 kg (3962 pounds)
11	2229 kg (4903 pounds)	1950 kg (4291 pounds)	2176 kg (4787 pounds)	1898 kg (4175 pounds)
12	2325 kg (5115 pounds)	2047 kg (4503 pounds)	2272 kg (4999 pounds)	1994 kg (4387 pounds)
13	2422 kg (5328 pounds)	2143 kg (4716 pounds)	2369 kg (5212 pounds)	2091 kg (4600 pounds)
14	2521 kg (5547 pounds)	2243 kg (4935 pounds)	2469 kg (5431 pounds)	2190 kg (4819 pounds)
15	2618 kg (5759 pounds)	2340 kg (5147 pounds)	2565 kg (5643 pounds)	2287 kg (5031 pounds)
16	2714 kg (5972 pounds)	2436 kg (5360 pounds)	2662 kg (5856 pounds)	2384 kg (5244 pounds)

System weights for single frame configurations with fiber optic switch cables

The weights listed for the configurations in this section:

- Have all switches fully populated with SPC cards and fiber optic switch cables
- Include switch cable weights
- Use a frame depth of 1544 mm (60.8 inches)

Notes:

1. Frames that are fully populated with fiber optic switch cables do not require 24 inch frame extenders.
2. If you mix copper switch cables into the frame, a frame extender will be required if a frame has more than 32 copper cable Switch Port Connection cards installed.
3. For every fiber optic cable SPC card that gets replaced by a copper cable SPC card, add approximately 2.3 kg (5.1 pounds) for the difference in cable weight.
4. For configurations that are completely populated with copper switch cables, refer to, Table 65 on page 292 or Table 66.

Table 67. System frame weights for single frame systems configured with fiber optic switch cables

Number of switches	Slimline doors, frame with IBF	Slimline doors, frame without IBF	No doors, frame with IBF	No doors, frame without IBF
1	607 kg (1334 pounds)	514 kg (1130 pounds)	580 kg (1276 pounds)	487 kg (1072 pounds)
2	665 kg (1464 pounds)	573 kg (1260 pounds)	639 kg (1406 pounds)	546 kg (1202 pounds)
3	724 kg (1593 pounds)	631 kg (1389 pounds)	698 kg (1535 pounds)	605 kg (1331 pounds)
4	786 kg (1729 pounds)	693 kg (1525 pounds)	760 kg (1671 pounds)	667 kg (1467 pounds)
5	845 kg (1858 pounds)	752 kg (1654 pounds)	818 kg (1800 pounds)	726 kg (1596 pounds)
6	903 kg (1987 pounds)	811 kg (1783 pounds)	877 kg (1929 pounds)	784 kg (1725 pounds)

Table 67. System frame weights for single frame systems configured with fiber optic switch cables (continued)

Number of switches	Slimline doors, frame with IBF	Slimline doors, frame without IBF	No doors, frame with IBF	No doors, frame without IBF
7	Refer to Table 68	890 kg (1958 pounds)	Refer to Table 68	864 kg (1900 pounds)
8	Refer to Table 68	949 kg (2087 pounds)	Refer to Table 68	922 kg (2029 pounds)

System weights for dual frame configurations with fiber optic switch cables

The weights listed for the configurations in this section:

- Have all switches fully populated with SPC cards and fiber optic switch cables
- Include switch cable weights
- Use a frame depth of 1544 mm (60.8 inches)

Notes:

1. Frames that are fully populated with fiber optic switch cables do not require frame extenders.
2. If you mix copper switch cables into the frame, a frame extender will be required if a frame has more than 32 copper cable Switch Port Connection cards installed.
3. For every fiber optic cable SPC card that gets replaced by a copper cable SPC card, add approximately 2.3 kg (5.1 pounds) for the difference in cable weight.
4. For configurations that are completely populated with copper switch cables, refer to, Table 65 on page 292 or Table 66 on page 293.

Table 68. System frame weights for dual frame systems configured with fiber optic switch cables

Number of switches	Slimline doors, frame with IBF	Slimline doors, frame without IBF	No doors, frame with IBF	No doors, frame without IBF
7	1386 kg (3050 pounds)	Refer to Table 67 on page 293	1334 kg (2934 pounds)	Refer to Table 67 on page 293
8	1445 kg (3179 pounds)	Refer to Table 67 on page 293	1392 kg (3063 pounds)	Refer to Table 67 on page 293
9	1507 kg (3315 pounds)	1322 kg (2907 pounds)	1454 kg (3199 pounds)	1269 kg (2791 pounds)
10	1681 kg (3698 pounds)	1403 kg (3086 pounds)	1628 kg (3582 pounds)	1350 kg (2970 pounds)
11	1740 kg (3827 pounds)	1462 kg (3215 pounds)	1687 kg (3711 pounds)	1409 kg (3099 pounds)
12	1798 kg (3957 pounds)	1520 kg (3345 pounds)	1746 kg (3841 pounds)	1468 kg (3229 pounds)
13	1857 kg (4086 pounds)	1579 kg (3474 pounds)	1804 kg (3970 pounds)	1526 kg (3358 pounds)
14	1919 kg (4222 pounds)	1641 kg (3610 pounds)	1866 kg (4106 pounds)	1588 kg (3494 pounds)
15	1978 kg (4351 pounds)	1700 kg (3739 pounds)	1925 kg (4235 pounds)	1647 kg (3623 pounds)
16	2037 kg (4480 pounds)	1758 kg (3868 pounds)	1984 kg (4364 pounds)	1706 kg (3752 pounds)

Shipping weights for switch-only frames

Table 69 lists the shipping weight for each supported switch-only frame configuration.

Table 69. Shipping weights for switch-only frames

Number of switches	Primary frame with IBF	Secondary frame with IBF	Primary frame without IBF	Secondary frame without IBF
1	566 kg (1245 pounds)	NA	473 kg (1041 pounds)	NA
2	623 kg (1371 pounds)	NA	530 kg (1167 pounds)	NA
3	730 kg (1605 pounds)	NA	637 kg (1401 pounds)	NA
4	790 kg (1738 pounds)	NA	697 kg (1534 pounds)	NA
5	847 kg (1864 pounds)	NA	755 kg (1660 pounds)	NA
6	905 kg (1990 pounds)	NA	812 kg (1786 pounds)	NA
7	962 kg (2116 pounds)	435 kg (956 pounds)	890 kg (1958 pounds)	NA
8	964 kg (2120 pounds)	490 kg (1078 pounds)	947 kg (2084 pounds)	NA
9	969 kg (2131 pounds)	545 kg (1200 pounds)	876 kg (1927 pounds)	453 kg (996 pounds)
10	1039 kg (2286 pounds)	647 kg (1424 pounds)	900 kg (1980 pounds)	508 kg (1118 pounds)
11	1041 kg (2290 pounds)	703 kg (1546 pounds)	902 kg (1984 pounds)	564 kg (1240 pounds)
12	1043 kg (2294 pounds)	758 kg (1668 pounds)	904 kg (1988 pounds)	619 kg (1362 pounds)
13	1045 kg (2298 pounds)	814 kg (1790 pounds)	906 kg (1992 pounds)	675 kg (1484 pounds)
14	1050 kg (2309 pounds)	869 kg (1912 pounds)	911 kg (2003 pounds)	730 kg (1606 pounds)
15	1052 kg (2313 pounds)	925 kg (2034 pounds)	912 kg (2007 pounds)	785 kg (1728 pounds)
16	1053 kg (2317 pounds)	980 kg (2156 pounds)	914 kg (2011 pounds)	841 kg (1850 pounds)

Notes:

1. Switch-only frames *with* the IBF option and seven or more switches require a two frame system. The IBF option limits the primary frame to a maximum of six switches.
2. Switch-only frames *without* the IBF option and nine or more switches require a two frame system. Without the IBF option, the primary frame will support a maximum of eight switches.
3. All two frame, switch-only configurations support a maximum of 16 switches.

Floor load calculations

Table 70 shows the specifications for calculating floor loading with switch-only frames. The listed frame weights include covers but the frame widths and depths are listed without covers. Frame dimensions with covers and Slimline doors are listed in “Frame dimensions” on page 289.

Table 70. Switch-only frame specifications for floor load calculations

Switch-only frame configuration		Switch-only frame specification
Frame weight with copper switch cables	Without IBF	1288 kg (2833 pounds)
	With IBF	1167 kg (2567 pounds)
Frame weight with fiber optic switch cables	Without IBF	985 kg (2167 pounds)
	With IBF	940 kg (2067 pounds)
Width (without covers)		750 mm (29.5 inches)
Depth with one or two switches (without covers)		1275 mm (50.2 inches)
Depth with three or more switches (without covers)		1783 mm (70.2 inches)

Table 70. Switch-only frame specifications for floor load calculations (continued)

Switch-only frame configuration	Switch-only frame specification
Notes: 1. Switch-only frames are configured with Slimline doors. 2. The listed weights include 3 m switch cables (1.25 kg each) and frame covers.	

Floor load calculations with copper switch cables

For frames with Slimline doors and copper switch cables, Figure 48 lists the recommended clearances between frames and the floor loading factor that results from each configuration. Figure 50 on page 298 illustrates the location of each dimension given in Figure 48.

Floor loading for systems with Slimline covers, IBF not installed

	a (sides)		b (front)		c (back)		1 Frame		2 Frames	
Condition	**in**	**mm**	**in**	**mm**	**in**	**mm**	**lb/ft2**	**kg/m2**	**lb/ft2**	**kg/m2**
1	1.0	25	10.0	254	10.0	254	157.6	769.7	150.4	734.3
2	1.0	25	20.0	508	20.0	508	133.6	652.2	127.6	623.2
3	1.0	25	30.0	762	30.0	762	116.9	570.7	111.9	546.2
4	10.0	254	10.0	254	10.0	254	109.4	534.2	122.4	597.5
5	10.0	254	20.0	508	20.0	508	94.1	459.4	104.7	511.2
6	10.0	254	30.0	762	30.0	762	83.5	407.6	92.5	451.5
7	20.0	508	10.0	254	10.0	254	85.1	415.6	103.0	503.0
8	20.0	508	20.0	508	20.0	508	74.2	362.3	88.9	433.9
9	20.0	508	30.0	762	30.0	762	66.7	325.4	79.1	386.0
10	30.0	762	10.0	254	10.0	254	71.7	350.0	90.1	439.8
11	30.0	762	20.0	508	20.0	508	63.2	308.6	78.3	382.2
12	30.0	762	30.0	762	30.0	762	57.3	280.0	70.1	342.2

Floor loading for systems with Slimline covers, IBF installed

	a (sides)		b (front)		c (back)		1 Frame		2 Frames	
Condition	**in**	**mm**	**in**	**mm**	**in**	**mm**	**lb/ft2**	**kg/m2**	**lb/ft2**	**kg/m2**
1	1.0	25	10.0	254	10.0	254	144.1	703.8	166.0	810.5
2	1.0	25	20.0	508	20.0	508	122.5	598.2	140.4	685.5
3	1.0	25	30.0	762	30.0	762	107.5	525.1	122.7	599.0
4	10.0	254	10.0	254	10.0	254	100.8	492.3	134.5	656.7
5	10.0	254	20.0	508	20.0	508	87.1	425.1	114.6	559.7
6	10.0	254	30.0	762	30.0	762	77.5	378.5	100.9	492.7
7	20.0	508	10.0	254	10.0	254	79.0	385.7	112.7	550.4
8	20.0	508	20.0	508	20.0	508	69.2	337.9	96.8	472.7
9	20.0	508	30.0	762	30.0	762	62.4	304.7	85.8	418.8
10	30.0	762	10.0	254	10.0	254	66.9	326.8	98.2	479.4
11	30.0	762	20.0	508	20.0	508	59.3	289.6	84.9	414.5
12	30.0	762	30.0	762	30.0	762	54.1	263.9	75.7	369.6

Figure 48. Frame clearances and associated floor loading factors for frames with Slimline doors and copper switch cables

Notes:

1. Service clearance is independent from weight distribution distance and must be at least 45 inches for the front of the frame and 36 inches for the rear of the frame (measured from the base frame with frame extenders).
2. Weight distribution areas should not overlap.
3. Floor loading weight distribution distances should not exceed 30 inches in any direction when measured from the base frame (without frame extenders).
4. The listed weights include 3 m switch cables (1.25 kg each).

Floor load calculations with fiber optic switch cables

For frames with Slimline doors and fiber optic switch cables, Figure 49 lists the recommended clearances between frames and the floor loading factor that results from each configuration. Figure 50 on page 298 illustrates the location of each dimension given in Figure 49.

Floor loading for systems with Slimline covers, fiber optic cables, IBF not installed

	a (sides)		b (front)		c (back)		1 Frame		2 Frames	
Condition	**in**	**mm**	**in**	**mm**	**in**	**mm**	**lb/ft2**	**kg/m2**	**lb/ft2**	**kg/m2**
1	1.0	25	10.0	254	10.0	254	150.9	736.7	141.4	690.3
2	1.0	25	20.0	508	20.0	508	123.0	600.4	115.6	564.3
3	1.0	25	30.0	762	30.0	762	105.2	513.6	99.1	484.0
4	10.0	254	10.0	254	10.0	254	105.1	513.2	115.4	563.4
5	10.0	254	20.0	508	20.0	508	87.3	426.5	95.3	465.5
6	10.0	254	30.0	762	30.0	762	76.0	371.2	82.6	403.2
7	20.0	508	10.0	254	10.0	254	82.1	400.6	97.4	475.6
8	20.0	508	20.0	508	20.0	508	69.4	338.9	81.4	397.2
9	20.0	508	30.0	762	30.0	762	61.3	299.5	71.1	347.3
10	30.0	762	10.0	254	10.0	254	69.3	338.4	85.4	417.0
11	30.0	762	20.0	508	20.0	508	59.5	290.4	72.0	351.6
12	30.0	762	30.0	762	30.0	762	53.2	259.9	63.5	309.9

Floor loading for systems with Slimline covers, fiber optic cables, IBF installed

	a (sides)		b (front)		c (back)		1 Frame		2 Frames	
Condition	**in**	**mm**	**in**	**mm**	**in**	**mm**	**lb/ft2**	**kg/m2**	**lb/ft2**	**kg/m2**
1	1.0	25	10.0	254	10.0	254	144.4	704.9	161.4	788.2
2	1.0	25	20.0	508	20.0	508	117.9	575.9	131.2	640.5
3	1.0	25	30.0	762	30.0	762	101.0	493.3	111.9	546.4
4	10.0	254	10.0	254	10.0	254	101.0	492.9	131.0	639.4
5	10.0	254	20.0	508	20.0	508	84.1	410.7	107.5	524.7
6	10.0	254	30.0	762	30.0	762	73.4	358.3	92.5	451.6
7	20.0	508	10.0	254	10.0	254	79.1	386.2	109.9	536.6
8	20.0	508	20.0	508	20.0	508	67.1	327.2	91.1	444.7
9	20.0	508	30.0	762	30.0	762	59.5	290.3	79.1	386.1
10	30.0	762	10.0	254	10.0	254	67.0	327.2	95.8	467.8
11	30.0	762	20.0	508	20.0	508	57.7	281.7	80.1	391.2
12	30.0	762	30.0	762	30.0	762	51.8	252.7	70.1	342.3

Figure 49. Frame clearances and associated floor loading factors for frames with Slimline doors and fiber optic switch cables

Notes:

1. Service clearance is independent from weight distribution distance and must be at least 45 inches for the front of the frame and 36 inches for the rear of the frame (measured from the base frame with frame extenders).
2. Weight distribution areas should not overlap.
3. Floor loading weight distribution distances should not exceed 30 inches in any direction when measured from the base frame (without frame extenders).

Frame clearance dimensions

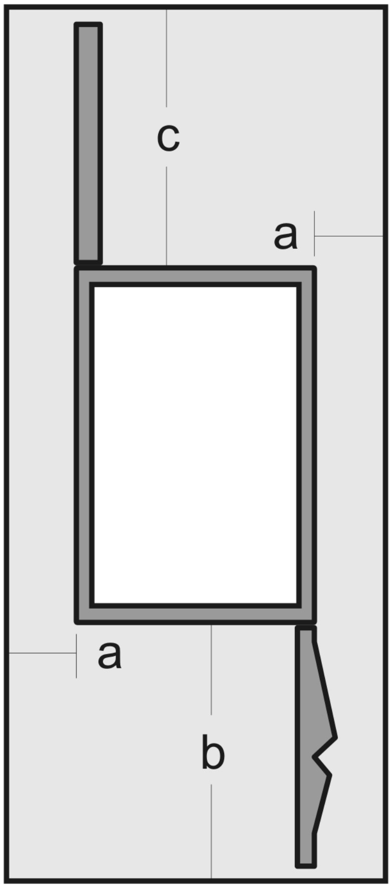


Figure 50. Frame clearance dimensions

Floor plans

When laying out your floor plan keep in mind:

Minimum aisle width
The minimum aisle width in front of the system is 1041 mm (41 inches) to allow room to perform service operations. The minimum aisle width is a separate requirement from the front service clearance, 1143 mm (45 inches). Refer to Figure 51 on page 299.

Thermal interactions
Multiple rows of systems should be configured to create ″hot″ and ″cold″ aisles. Opposing rows of systems should be situated front to front and rear to rear. Refer to Figure 51 on page 299.

Floor tile requirements
In a multi-frame installation it is possible that a floor tile with cable cutouts will bear two concentrated static loads up to 900 pounds per caster (leveler). Therefore, the total concentrated load can be as high as 1800 pounds. Please contact the floor tile manufacturer or consult a structural engineer to make certain that the raised floor assembly can support this load.

Network expansion
Switch-only frames with more than 32 copper switch cable Switch Port Connection cards require a 24 inch frame extender. In addition, some switch-only frame systems require a two-frame system. If you are planning to expand your system into a configuration that requires frame extenders or wider frames, make certain that you allow for all future space requirements when laying out your current floor plan. Switch-only frames that require a two frame system are configurations with:

- Six or more switches and the IBF option
- Eight or more switches without the IBF option

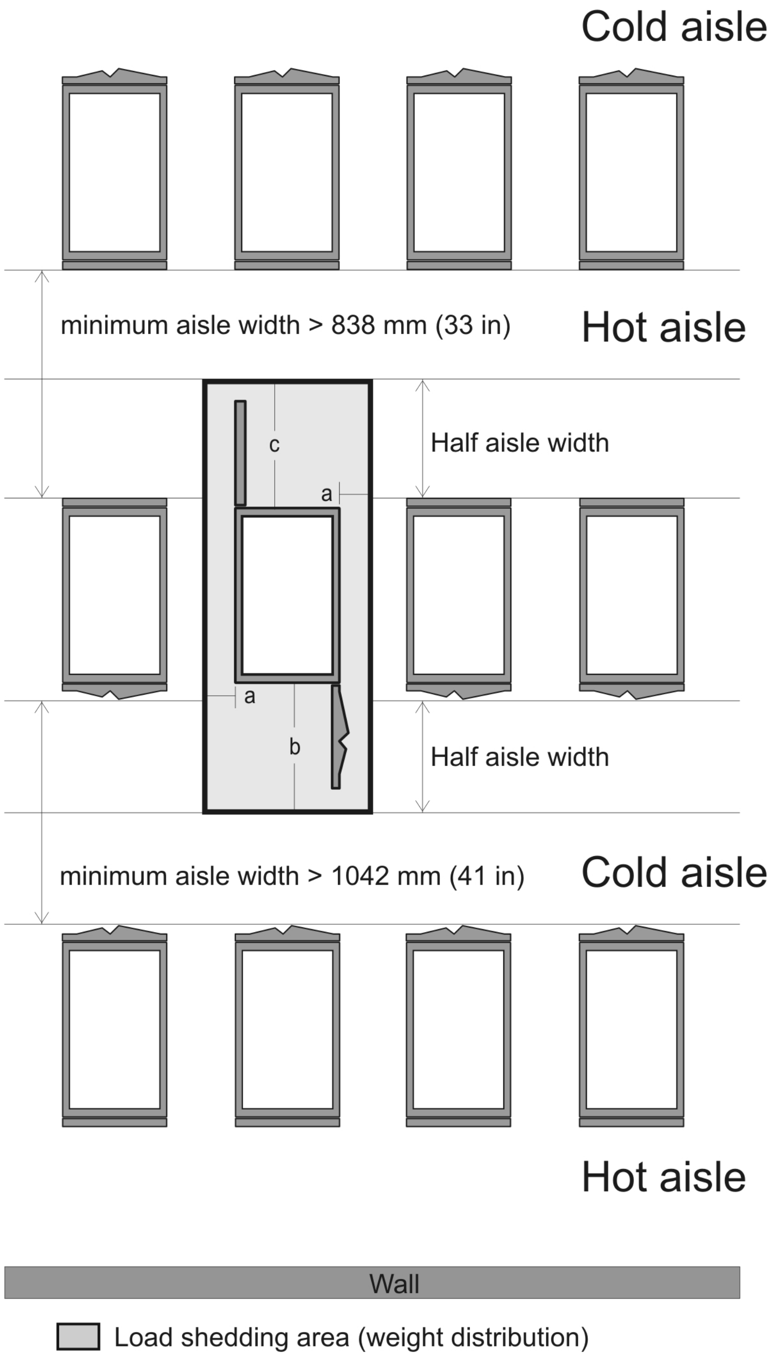


Figure 51. Floor plan for minimum aisle widths and cooling airflow

Floor tile cutouts

Floor tile cutouts are only required for switch-only frames with one or two switches in the frame. Frames with three of more switches in one frame require a 24 inch frame extender on the rear of the frame. When installed, the frame extender covers the tile immediately behind the frame. Because of that, you have the option of removing the entire tile covered by the extended frame or making a cutout that fits your cable requirements.

Note: Floor tile cutout dimensions for server frames are listed in the appropriate server documentation.

Floor tile cutouts for frames without extenders

Figure 52 on page 301 shows the recommended floor tile cutout patterns for frames with either one or two switches installed. Cutout locations will vary for stringer and non-stringer floors. However, the cutouts shown in Figure 52 will work for both floor types. A non-stringer floor does not allow corner cuts unless you place additional support pedestals under the tile to provide the support taken away by cutting off the corner of the tile. The pattern used in Figure 52 avoids corner cuts. The illustrated patterns are valid for both 24 inch (610 mm) and 23.6 inch (600 mm) tiles.

Note: Single frame switch systems with 33 or more copper cable Switch Port Connection cards installed require a 24 inch frame extender. Refer to “Floor tile cutouts for extended frames” on page 302 for information those systems.

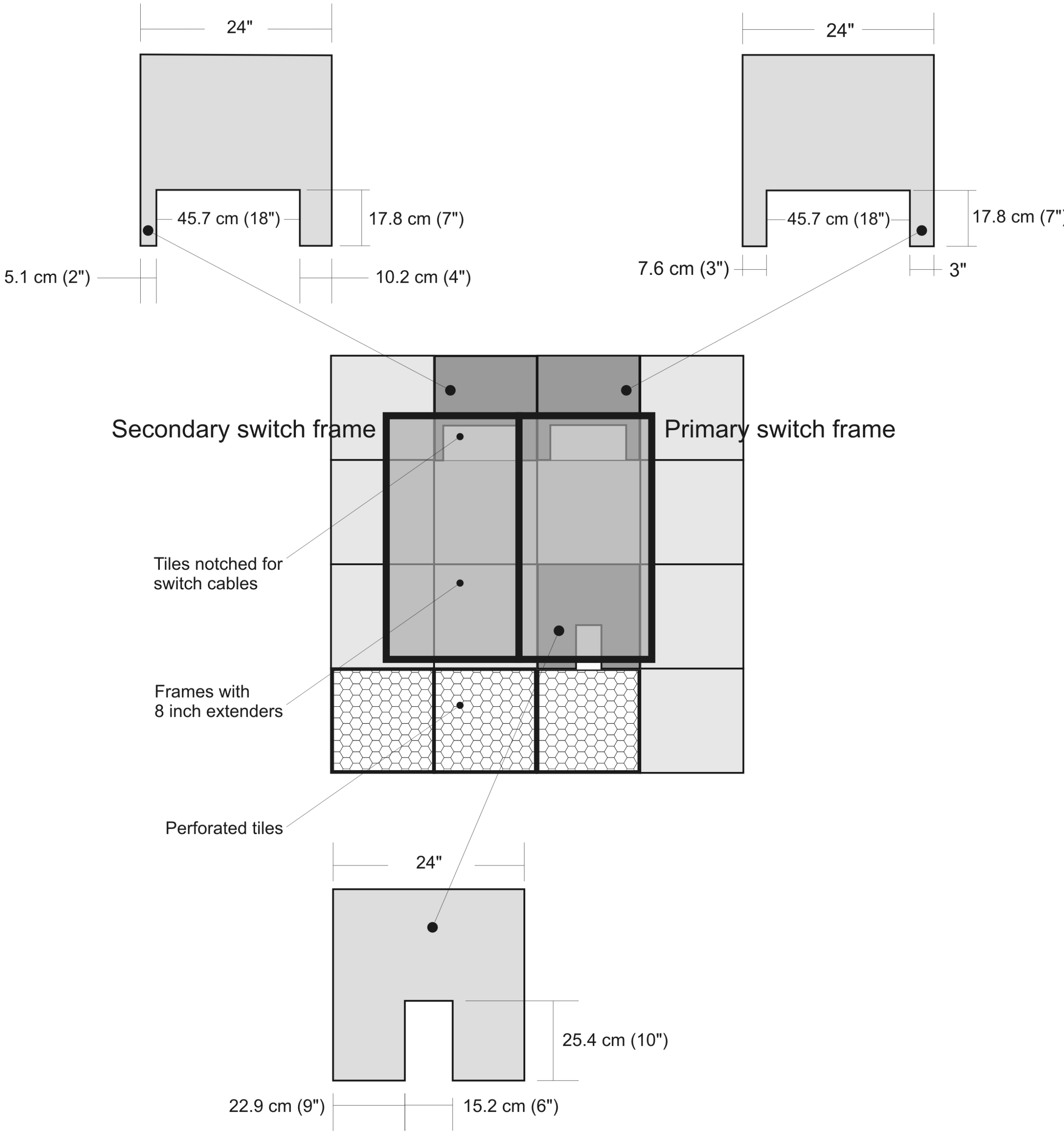


Figure 52. Floor tile cutout patterns for a switch-only frames with eight inch frame extenders.

Note: This figure shows a dual frame configuration. If your installation is using a single frame configuration, use the dimensions associated with the primary frame.

Notes:

1. This arrangement and tile cut recommendation is based on having a common frame placements in the system and considering expansion to additional switches. Alternate arrangements may be needed to meet specific requirements of a given installation.
2. Center the primary frame over one tile set as shown in Figure 52.
3. Place the secondary frame adjacent to the primary frame

4. Set the primary frame and the secondary frame approximately 50 mm (2 inches) back from the edge of the perforated tiles as shown in Figure 52 on page 301.

   Note: When placing the frame, measure the distance from the front of the frame. Do not measure from the front cover.
5. Place one perforated tile in front of the primary frame.
6. Place two perforated tiles in front of the secondary frame.
7. This arrangement and tile cut recommendation is based on having a common frame placements in the system and considering expansion to additional switches. Alternate arrangements may be needed to meet specific requirements of a given installation.
8. Make certain that EMC skirts are installed properly and resting on the floor tile surface.
9. Minimize tile openings which could adversely affect cooling airflow.

Floor tile cutouts for extended frames

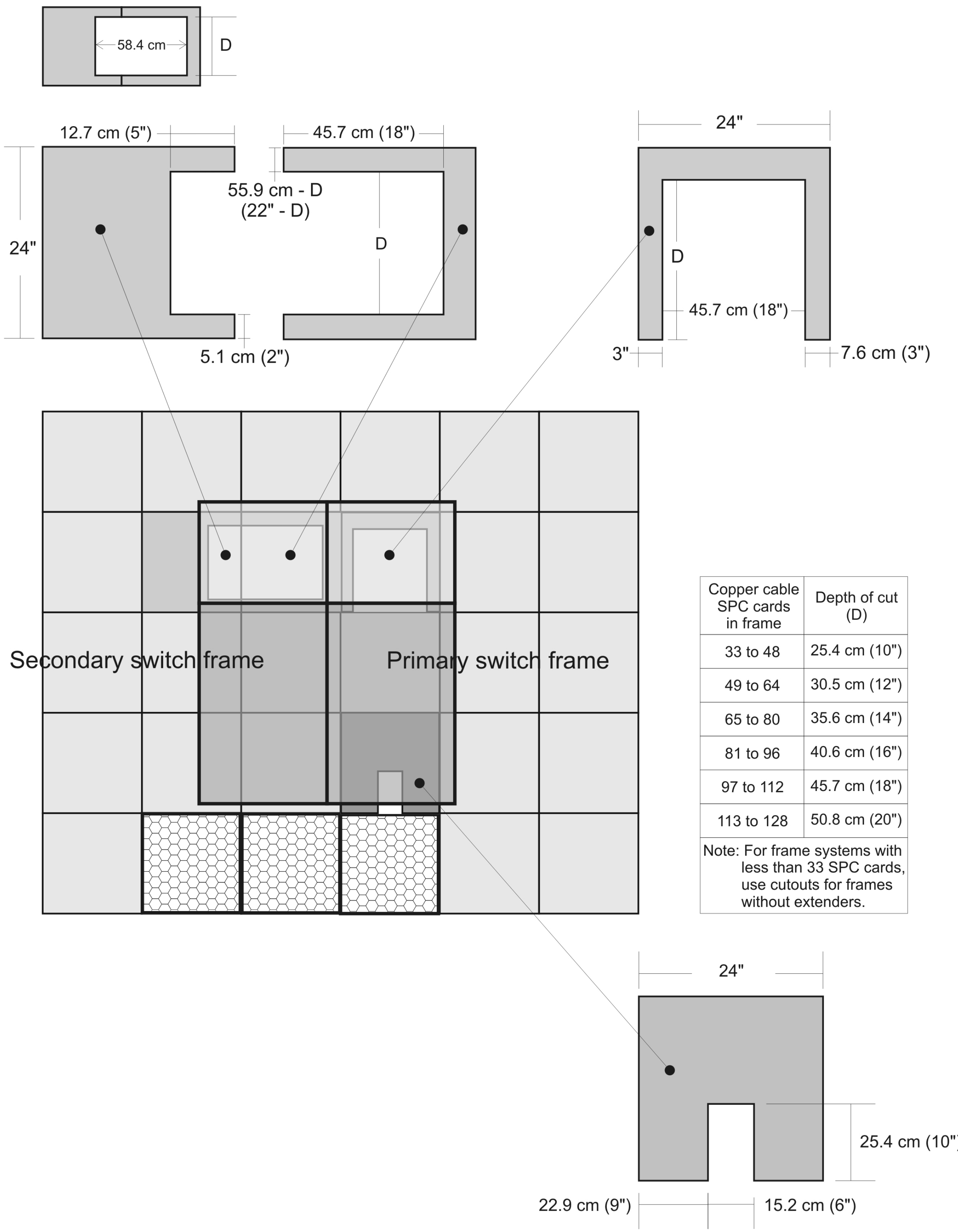
Switch-only frames with three or more switches or more than 32 copper switch cables require 24 inch frame extenders. The frame extender attaches to the rear of the frame and accommodates the necessary switch cables. Because the frame extender covers the entire tile behind the frame, you have the option of leaving that tile out or cutting the tile to match your cable requirements as shown in Figure 53 on page 303.

Note: If you are installing a single frame with a 24 inch extender, use the placement and floor tile cutout recommendations for the primary frame.

Figure 53 on page 303 shows the dimensions and configuration of the recommended switch cable cutouts. You may vary the actual cutouts as required to meet your installation requirements. In addition to the recommended dimensions, dual frame switch-only systems have these additional recommendations:

- Center the primary frame over one tile set.
- Make the switch cable cutout for the primary frame on one tile.
- Place the secondary frame adjacent to the primary frame.
- Make the switch cable cutouts for the secondary frame across two tiles.
- Note the difference in orientation between the switch cable cutouts for the primary frame and for the secondary frame.
- Set the primary frame and the secondary frame approximately 50 mm (2 inches) back from the edge of the perforated tiles as shown in Figure 53 on page 303.

  Note: When placing the frame, measure the distance from the front of the frame. Do not measure from the front cover.
- Place one perforated tile in front of the primary frame.
- Place two perforated tiles in front of the secondary frame.
- This arrangement and tile cut recommendation is based on having a common frame placements in the system and considering expansion to additional switches. Alternate arrangements may be needed to meet specific requirements of a given installation.
- Make certain that EMC skirts are installed properly and resting on the floor surface.
- Minimize tile openings which could adversely affect cooling airflow.



Copper cable SPC cards in frame	Depth of cut (D)
33 to 48	25.4 cm (10")
49 to 64	30.5 cm (12")
65 to 80	35.6 cm (14")
81 to 96	40.6 cm (16")
97 to 112	45.7 cm (18")
113 to 128	50.8 cm (20")

Note: For frame systems with less than 33 SPC cards, use cutouts for frames without extenders.

Figure 53. Floor tile cutout patterns for switch-only frame systems with twenty-four inch frame extenders.

Note: This figure shows a dual frame configuration. If your installation is using a single frame configuration, use the dimensions associated with the primary frame.

Frame service clearances

All floor plan layouts need to include open areas to the front, rear, and sides of each frame. These open areas allow service personnel to access frame mounted components as well as providing a circulation path for cooling airflow. Clearance requirements for the HPS frame depend on the door style used on the frame. Depending on the door style used on your frames, refer to "Service clearances for frames with Slimline doors."

Service clearances for frames with Slimline doors

Service clearances for Slimline doors are illustrated in Figure 54.

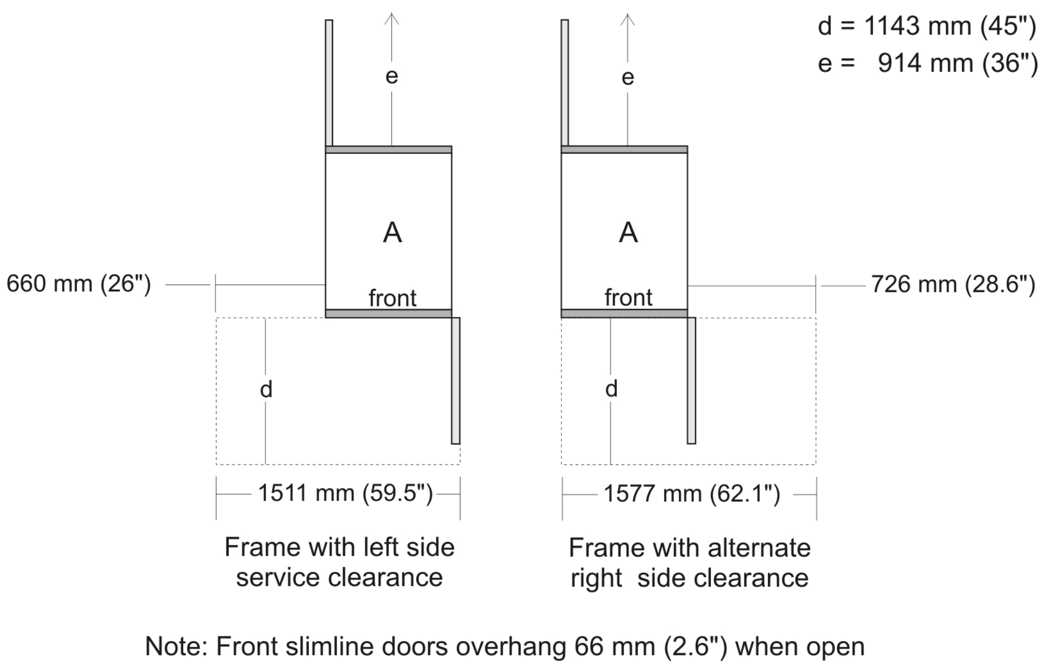


Figure 54. Service clearances for switch frames with Slimline doors

Appendix C. HPS network configuration

This appendix contains information needed to plan and configure the HPS network.

"Network configuration planning"
Provides an overview of the HPS components and detailed steps for calculating the number and type of each component needed for your network.

"Installing switch network connection components" on page 323
Provides instructions for installing HPS network components

Note: After installing all network components but before you power up the CECs, refer to "Bringing the network online and reporting Installation Complete" on page 109 for additional procedures.

Attention: Before you install any network components, you **must** determine the required installation locations as well as the connection endpoints for each link. The procedures in this appendix and in Appendix D, "Cabling the HPS," on page 337 will assist you with those planning tasks. The information in these appendices follows a set of rules that provide optimum distribution of links across the system. Failure to adhere to those rules will result in network errors and performance degradation.

Planning non-standard networks

If you are cabling a network configuration:

- That is not specifically described in Appendix D, "Cabling the HPS," on page 337, you must work with your special bids representative to make certain that all cabling issues are properly addressed.
- That has a mix of p5-575 servers and p5-590 or p5-595 servers, you will have to make allowances for the mix of Switch Port Connection cards for fiber optic and copper switch cables. For these networks, you must work with your special bids representative to make sure that the related cabling issues are properly addressed.

Network configuration planning

The HPS network has four basic components:
1. The HPS
2. Switch Network Interfaces
3. Switch Port Connection cards
4. Switch cables

1) The HPS
The HPS may be configured for server-to-switch and switch-to-switch communications.

Switches may have some ports configured as server-to-switch ports and other ports configured for switch-to-switch communication. Larger networks may be configured with additional switches for dedicated switch-to-switch communication.

2) Switch Network Interfaces (SNIs)
The Switch Network Interface connects the server to the network.

Depending on type of IBM @server p5 server, the required SNI is either a 2-Link copper cable SNI (p5-575 servers) or a pair of 1-Link fiber optic cable SNIs (p5-590 and p5-595 servers). At the server, the SNI directs traffic onto the network through the external links. From the external link, the switch cable carries the signal to Switch Port Connection cards mounted in the switch.

3) Switch Port Connection (SPC) cards
Switch Port Connection cards are the risers that connect the switch to the network. Each SPC card is capable of handling two server-to-switch or switch-to-switch links.

Three types of SPC cards are available for the HPS:

- Copper cable connectors
- Fiber optic cable connectors
- A blank filler card for unused switch slots

Notes:

1. **All** unused switch slots must be filled with a blank SPC card.
2. Any port on a copper cable SPC card that does not have a cable attached must have port cover installed for EMC compliance.
3. Copper cable SPC cards have two connector ports. Both the T1 and T2 ports on these cards will transmit and receive data.
4. Fiber optic SPC cards have four connector ports. On these cards, the T1 and T2 ports have separate ports for data input (T1i and T2i) and data output (T1o and T2o).

4) Switch cables

The HPS has 0.5 m, 1.2 m, 3 m and 10 m copper cable options for server-to-switch or switch-to-switch connections. The 1.2 m and 3 m cables are used for in-frame connections while the 10 m cable is used for frame-to-frame connections. In addition, there are 3.5 m, 10 m, 20 m, 30 m, and 40 m fiber optic cable options for server-to-switch or switch-to-switch connections.

Note: Fiber optic cables are supplied in pairs.

In the simplest terms, planning a HPS network consists of five sequential calculations that determine the number and type of network components needed for your system. These calculations:

1. Determine the number of links required for your network
2. Determine the number of Switch Network Interfaces required to support those links
3. Determine the number of Switch Port Connection cards required to support the network links
4. Determine the number of switches required to support the switch port connections and for your network configuration
5. Determine the number, length, and type of switch cables required

Note: Complete each calculation in the order listed.

When you begin planning the configuration of your HPS network, there are several factors you need to keep in mind:

Compatible machine types

Determines:

- Where switch boards may be located in a server rack
- How many switch boards may be located in the server racks
- The type of Switch Network Interfaces (SNIs) required

Note: Switches located in a server rack must be configured as Node Switch Boards. Intermediate Switch Boards cannot be installed in a server frame.

Network links

Determines the number of:

- Node Switch Boards (NSBs) needed
- Intermediate Switch Boards (ISBs) needed
  - ISBs are required on large networks for dedicated switch-to-switch communication
- SNIs required
- Switch port connection (riser) cards needed
- Switch cables required

Future network expansion

Preplan current network layout for:

- Switch placement that allows adding switch boards with minimal network disruption
- Switch cable upgrades with minimal network disruption
- Switch network connection card locations that allow adding new risers with minimal network disruption

Expanding non-standard networks

If you are planning a network configuration that is not specifically described in the network planning tables, you must work with your special bids representative to make certain that all cabling issues are properly addressed.

For example, you are expanding a single network system having 4 ISBs and 5 NSBs into a network with 8 NSBs. Since the initial network was not fully populated, it is a non-standard network with switch cable configuration requirements that this document does not describe. You will need to consult with your special bids representative to make certain that the correct changes are made to the non-standard switch cable configuration as you make it into a fully populated 8 NSB network. For non-standard networks, you must consider the following:

- Configurations with less than 5 NSBs are considered sparse networks and they do not have a standard cable configurations and the NSB switch numbers may also be different.
- Your special bids representative will provide details on revising NSB switch numbers and on how each switch should be recabled.

Compatible machine types

The HPS is compatible with these IBM @server p5 servers and racks:

- IBM @server p5 575 servers
- IBM @server p5 590 servers
- IBM @server p5 595 servers
- 24 inch powered expansion rack FC 5792/8691 racks

M/T 9118-575 (p5-575 servers)

1. A p5-575 server frame may have one or two High Performance Switches installed. You must configure both switches as NSBs. The first switch must be installed in frame slot one (U1.1). The second switch must be installed in frame slot two (U1.5).
2. p5-575 servers are compatible with:
   - 2-Link Switch Network Interface (**FC 7910**)
   - One 2-Link SNI may be installed in each p5-575 server

M/T 9119-590 (p5-590 servers)

1. A p5-590 server may have one High Performance Switch installed. You must configure the switch as an NSB and it must be installed in the first frame slot position. If an I/O drawer is installed in that frame slot you have two options:
   a. Relocate the I/O drawer to another frame slot
   b. Install the switch in an optional switch-only-frame
2. p5-590 servers are compatible with:
   - 1-Link Switch Network Interface (**FC 7817**)
   - Two or four 1-Link SNIs may be installed in each p5-590 server

M/T 9119-595 (p5-595 servers)

1. A p5-595 server may have one High Performance Switch installed. You must configure the switch as an NSB and it must be installed in the first frame slot position. If an I/O drawer is installed in that frame slot you have two options:
   a. Relocate the I/O drawer to another frame slot
   b. Install the switch in an optional switch-only-frame

2. p5-595 servers are compatible with:
   - 1-Link Switch Network Interface (**FC 7817**)
   - Two, four, six, or eight 1-Link SNIs may be installed in each p5-595 server

24 inch powered expansion rack FC 5792/8691 racks

In some cluster configurations, a separate, switch-only rack may be a desirable option or a system requirement. Smaller networks using optional switch-only racks benefit from simplified network set up and maintenance. Large networks may require switch-only racks based on the number or configuration of switches in the system. For switch-only configurations, a 24 inch powered expansion rack FC 5792/8691 rack must be used for the HPS. When configuring the 24 inch powered expansion rack FC 5792/8691 rack:

- The High Performance Switches may be configured as ISBs (Intermediate Switch Boards) for switch-to-switch communication
- The High Performance Switches may be configured as NSBs (Node Switch Boards) for server-to-switch communication
- High Performance Switches configured as ISBs are only available as sets of two ISBs (systems with four NSBs), sets of four ISBs (systems with five to eight NSBs), or sets of eight ISBs (two network configurations with up to sixteen NSBs)
- ISBs and NSBs may be located in the same switch-only rack
- All switch-only racks must be connected to the cluster service network
- Refer to "Switch installation order for switch-only frames" on page 85 for specific information on physically locating switches in the frame
- Some switch configurations may require additional BPR units for the rack

Note: Configuring your system with switch-only racks simplifies:
- Adding switches to the system
- Reconfiguring or adding servers to the system
- Switch cabling
- System maintenance

Network link requirements

Up to 128 links are supported on each HPS network (larger networks are available through special order). All networks require either two links for each server or LPAR connected the network. If you have either of the following configurations, then the network must be cabled sequentially, fully populating one switch at a time

- A single network system with an odd number of Node Switch Boards
- A dual network system with an odd number of Node Switch Boards on each network

Note: When you expand these network configurations, the switches may have to be recabled before the network can be initialized.

If you have either of the following configurations, then the network can be cabled using an alternating switch pattern

- A single network system with an even number of Node Switch Boards
- A dual network system with an even number of Node Switch Boards on each network

Note: Using the alternating switch pattern, future network expansions can be done without recabling the switches.

Links: maximum bandwidth or maximum connectivity

The HPS network may have:

- Up to 128 p5-575 servers with one LPAR each
- Up to 16 p5-590 server with one or two LPARs per server

- Up to 16 p5-595 server with up to four LPARs per server
- No more than 16 p5-590 or p5-595 servers in any combination
- No more than 128 p5-575, p5-590, or p5-595 servers in any combination

When you configure the network you have the option of assigning links to allow for either maximum bandwidth or maximum connectivity. By assigning the minimum number of links (one pair) to each server or LPAR, you will maximize the number of servers or LPARs that can be connected to the switch. Conversely, by assigning the maximum numbers of links to each server or LPAR, you maximize the bandwidth available to that node.

Link assignment rules:

1. When you configure the network you must assign one or more link pairs to each server or server LPAR connected to the switch.
2. Link pairs on an SNI can only be allocated to the server or LPARs of that server in which the SNI is installed.
3. On a dual network system, the individual links of a link pair **must** be installed on different networks.
4. Individual links of a link pair cannot be shared between servers or LPARs; both links of the link pair must be assigned to the same LPAR.
5. Each p5-575 server must have one link pair
6. Each p5-590 server must have one or two link pairs
7. Each p5-595server may up to four link pairs

p5-575 server links: Each p5-575 server connects to the switch network using one link pair provided by a 2-Link SNI (**FC 7910**). Each p5-575 server must be configured as a single LPAR. Therefore, maximum bandwidth is the same as maximum connectivity for these servers. With a two network configuration, you can have up to 128 LPARs connected to the switch using 256 links. With a single network configuration, you may have 64 LPARs connected to the switch using 128 links.

p5-590 and p5-595 server links: Each p5-590 or p5-595 server connects to the switch network using pairs of 1-Link SNIs (**FC 7817**). The SNI configuration and the total number of links available to the network depends on the server type.

- p5-590 server link options:
  - Two links: requires **FC 7817** SNIs mounted in slot 8 and slot 9 of node slot 1 (P2)
  - Four links: requires the first SNI pair plus additional **FC 7817** SNIs mounted in slots 8 and 9 of node slot 2 (P3)
    - Assigning both link pairs to one LPAR maximizes bandwidth available to that LPAR
    - Assigning one link pair to each LPAR maximizes connectivity with two LPARs on the switch
- p5-595 server link options:
  - Two links: requires **FC 7817** SNIs mounted in slot 8 and slot 9 of node slot 1 (P2)
  - Four links: requires the first SNI pair plus additional **FC 7817** SNIs mounted in slots 8 and 9 of node slot 2 (P3)
    - Assigning both link pairs to one LPAR maximizes bandwidth available to that LPAR
    - Assigning one link pair to each LPAR maximizes connectivity with two LPARs on the switch
  - Six links: requires the first two SNI pairs plus additional **FC 7817** SNIs mounted in slots 8 and 9 of node slot 3 (P4)
    - Assigning three link pairs to one LPAR maximizes bandwidth available to that LPAR
    - Assigning one link pair to each LPAR maximizes connectivity with three LPARs on the switch
  - Eight links: requires the first three SNI pairs plus additional **FC 7817** SNIs mounted in slots 8 and 9 of node slot 4 (P5)

- Assigning four link pairs to one LPAR maximizes bandwidth available to that LPAR
- Assigning one link pair to each LPAR maximizes connectivity with four LPARs on the switch

Determining the number of links required

In this section you will determine the number of links required to connect your servers to the switch. In general, each LPAR requires one pair of links to connect it to the switch. However, depending on the server type, some LPARs may have more than one link pair connecting it to the switch. That option would be used to increase the bandwidth available to that LPAR. Therefore, the total number of links required for each system is controlled by:

- The type of servers used in the cluster
- The number of LPARs that must be connected to the network
- The bandwidth needed by each LPAR (refer to “Links: maximum bandwidth or maximum connectivity” on page 308)
- Cluster scaling rules

Cluster scaling rules state that a Cluster 1600 system configured with the HPS and IBM eServer p5 servers can have:

- Up to 128 links with a single network configuration
- Up to 256 links for a two network configuration
- Up to 128 p5-575 servers with one LPAR and one link pair
- Up to 16 p5-590 servers with either:
  – One LPAR with one link pair
  – One LPAR with two link pairs
  – Two LPARs with one link pair for each LPAR
- Up to 16 p5-595 servers with either:
  – One LPAR with one to four link pairs
  – Two LPARs with one to three link pairs
  – Three LPARs with one or two link pairs for each LPAR
  – Four LPARs with one link pair for each LPAR
- No more than 16 p5-590 or p5-595 servers in any combination

Note: Link pairs assigned to an LPAR must be located on an SNI installed in the server with that LPAR.

To determine how many links are required for your system, you need to know the number and type of servers used and how many LPARs need to be configured for maximum bandwidth and maximum connectivity. Copy Table 71 and enter the server and LPAR numbers into the table. Follow the instruction provided in the table notes and calculate the number of links required for your network configuration.

Note: Table 72 on page 311 provides a working example for these calculations.

Table 71. Determining the number of network links required

Server type	LPARs per server [1]	Link options available per LPAR [2]				Link option requirement	Servers with this configuration	Links used [3]
		LPAR number						
		1	2	3	4			
p5-575	1	2						
p5-590	1	2						
		4						
	2	2	2					

Table 71. Determining the number of network links required (continued)

Server type	LPARs per server [1]	Link options available per LPAR [2]				Link option requirement	Servers with this configuration	Links used [3]
		LPAR number						
		1	2	3	4			
p5-595	1	2						
		4						
		6						
		8						
	2	2	2					
		2	4					
		2	6					
		4	4					
	3	2	2	2				
		2	4	2				
	4	2	2	2	2			
						Total links in network:		

Notes:

1. LPARs per server applies to switch connected LPARs. Each server may have additional LPARs off the switch.
2. The link options available per LPAR lists the number of links that may be configured into each switch connected LPAR of a specific server. Refer to “p5-590 and p5-595 server links” on page 309 and “p5-575 server links” on page 309 for additional information.
3. To determine the number of links used:
   a. For each link option per LPAR, add the number of links used across each option row.
   b. Enter the sum in the option requirement column
   c. Multiply the option requirement by the number of servers with that configuration
   d. Enter the product in the links used column.
   e. Add the numbers down the links used column.
   f. Enter the grand total at the bottom of the table (cannot exceed 32 for standard installations).
   g. Refer to “Link determination example” and Table 72 for a working example.

Link determination example: The sample network described in Table 72 uses four p5-595 servers and two p5-575 servers. After completing the table, you will find that this network requires 28 links. For this example, the servers are configured as a single network system using:

- Two p5-575 servers, each having one switch connected LPAR with two switch links (2 link option)
- One p5-595 server having one LPAR with eight switch links (8 link option)
- Two p5-595 servers having two LPARs with both LPARs on both servers using two switch links (2, 2 link option)
- One p5-595 server having two LPARs with one LPAR having two switch links and the second LPAR having six switch links (2, 6 link option)

Table 72. Example: determining links required

Server type	LPARs per server	Link options available per LPAR				Link option requirement	Servers with this configuration	Links used
		LPAR number						
		1	2	3	4			
p5-575	1	2				2	2	4

Table 72. Example: determining links required (continued)

Server type	LPARs per server	Link options available per LPAR				Link option requirement	Servers with this configuration	Links used
		LPAR number						
		1	2	3	4			
p5-590	1	2						
		4						
	2	2	2					
p5-595	1	2						
		4						
		6						
		8				8	1	8
	2	2	2			4	2	8
		2	4					
		2	6			8	1	8
		4	4					
	3	2	2	2				
		2	4	2				
	4	2	2	2	2			
						Total links in network:		**28**

To determine the number of links used:
1. For each link option per LPAR, add the number of links used across each option row.
2. Enter the sum in the option requirement column
3. Multiply the option requirement by the number of servers with that configuration
4. Enter the product in the links used column.
5. Add the numbers down the links used column.
6. Enter the grand total at the bottom of the table (cannot exceed 32 for standard installations).

Determining the number of SNIs required

In the previous section, you determined:

- The number and type of servers used in your cluster
- The number of LPARs connected to the switch network
- The number of links required to provide the bandwidth and connectivity required for you cluster

In this section, you will determine the number of Switch Network Interfaces (SNIs) required to support the network links.

The available SNI options for IBM @server p5 servers include:

- p5-575 servers
  - **FC 7910** 2-Link SNI
  - Installed on the GX bus in slot C66 or C65
  - Requires copper switch cables
  - Refer to “p5-575 server links” on page 309 for details
- p5-590 and p5-595 servers
  - **FC 7817** 1-Link SNI
  - **FC 7817** SNIs must be ordered and installed in pairs
  - SNIs must be installed in slots 8 and 9 of the server processor books
  - Requires fiber optic switch cables
  - Refer to “p5-590 and p5-595 server links” on page 309 for details

Copy Table 73 and use it to calculate the number of each SNI type required. Usage instructions are provided in the table notes and Table 74 on page 314 provides a working example for this calculation.

Table 73. Determining the number of each SNI type required

Server type	LPARs per server[1]	Links available per LPAR [2]				SNI requirement [3]		Servers with this configuration	SNIs used [4]	
		LPAR number				2-Link	1-Link pairs		2-Link	1-Link[5]
		1	2	3	4					
p5-575	1	2				1	NA			
p5-590	1	2				NA	1			
		4				NA	2			
	2	2	2			NA	2			
p5-595	1	2				NA	1			
		4				NA	2			
		6				NA	3			
		8				NA	4			
	2	2	2			NA	2			
		2	4			NA	3			
		2	6			NA	4			
		4	4			NA	4			
	3	2	2	2		NA	3			
		2	4	2		NA	4			
	4	2	2	2	2	NA	4			
							Total SNIs in network:			

Notes:

1. LPARs per server applies to switch connected LPARs. Each server may have additional LPARs off the switch.
2. The link options available per LPAR lists the number of links that may be configured into each switch connected LPAR of a specific server.
3. The SNI requirement lists the number and type of SNIs that are required for each LPAR link option.
4. To determine the number of each SNI type used:
   a. Refer to Table 71 on page 310 and enter the number of servers you will be using for each link option.
   b. Multiply the number of 2-Link SNIs required by the number of servers with that configuration.
   c. Enter the product on the 2-Link side of the SNIs used column.
   d. Add the numbers down 2-Link side of the SNIs used column and enter the total in the last row.
   e. Multiply the number of 1-Link SNI pairs required by the number of servers with that configuration to get the number SNI pairs required.
   f. Multiply the number of 1-Link SNI pairs required by 2 to get the number SNIs required.
   g. Enter the product on the 1-Link side of the SNIs used column.
   h. Add the numbers down 1-Link side of the SNIs used column and enter the total in the last row.
   i. Refer to "SNI determination example" and Table 74 on page 314 for a working example.
5. The number of 1-Link SNIs required is equal to the number of 1-Link SNI pairs multiplied by 2.

SNI determination example

This example is a continuation of the example given in "Link determination example" on page 311. The sample network described in that example and in Table 74 on page 314 uses four p5-595 servers and two p5-575 servers. The servers are configured as a single network system using:

- Two p5-575 servers, each having one switch connected LPAR with two switch links
- One p5-595 server having one LPAR with eight switch links
- Two p5-595 servers having two LPARs with both LPARs on both servers using two switch links

- One p5-595 server having two LPARs with one LPAR having two switch links and the second LPAR having six switch links

After completing the table, you find that the network requires 26 SNIs:
- Two of the SNIs are **FC 7917** 2-Link SNIs for p5-575 servers
- Twenty-four are **FC 7817** 1-Link SNIs for p5-595 servers

To determine the number of each SNI type used:
1. Refer to Table 71 on page 310 and enter the number of servers you will be using for each link option.
2. Multiply the number of 2-Link SNIs required by the number of servers with that configuration.
3. Enter the product on the 2-Link side of the SNIs used column.
4. Add the numbers down 2-Link side of the SNIs used column and enter the total in the last row.
5. Multiply the number of 1-Link SNI pairs required by the number of servers with that configuration to get the number SNI pairs required.
6. Multiply the number of 1-Link SNI pairs required by 2 to get the number SNIs required.
7. Enter the product on the 1-Link side of the SNIs used column.
8. Add the numbers down 1-Link side of the SNIs used column and enter the total in the last row.

Note: The calculation instructions are repeated in the notes at the end of the table.

Table 74. Example: determining SNIs required

Server type	LPARs per server[1]	Links available per LPAR [2]				SNI requirement [3]		Servers with this configuration	SNIs used [4]	
		LPAR number				2-Link	1-Link pairs		2-Link	1-Link[5]
		1	2	3	4					
p5-575	1	2				1	NA	2	2	
p5-590	1	2				NA	1			
		4				NA	2			
	2	2	2			NA	2			
p5-595	1	2				NA	1			
		4				NA	2			
		6				NA	3			
		8				NA	4	1		8
	2	2	2			NA	2	2		8
		2	4			NA	3			
		2	6			NA	4	1		8
		4	4			NA	4			
	3	2	2	2		NA	3			
		2	4	2		NA	4			
	4	2	2	2	2	NA	4			
							Total SNIs in network:		2	24

Table 74. Example: determining SNIs required (continued)

Server type	LPARs per server[1]	Links available per LPAR [2]				SNI requirement [3]		Servers with this configuration	SNIs used [4]	
		LPAR number				2-Link	1-Link pairs		2-Link	1-Link[5]
		1	2	3	4					

Notes:

1. LPARs per server applies to switch connected LPARs. Each server may have additional LPARs off the switch.
2. The link options available per LPAR lists the number of links that may be configured into each switch connected LPAR of a specific server.
3. The SNI requirement lists the number and type of SNIs that are required for each LPAR link option.
4. To determine the number of each SNI type used:
   a. Refer to Table 71 on page 310 and enter the number of servers you will be using for each link option.
   b. Multiply the number of 2-Link SNIs required by the number of servers with that configuration.
   c. Enter the product on the 2-Link side of the SNIs used column.
   d. Add the numbers down 2-Link side of the SNIs used column and enter the total in the last row.
   e. Multiply the number of 1-Link SNI pairs required by the number of servers with that configuration to get the number SNI pairs required.
   f. Multiply the number of 1-Link SNI pairs required by 2 to get the number SNIs required.
   g. Enter the product on the 1-Link side of the SNIs used column.
   h. Add the numbers down 1-Link side of the SNIs used column and enter the total in the last row.
5. The number of 1-Link SNIs required is equal to the number of 1-Link SNI pairs multiplied by 2.

SNI illustrations

2-Link SNI (FC 7910):

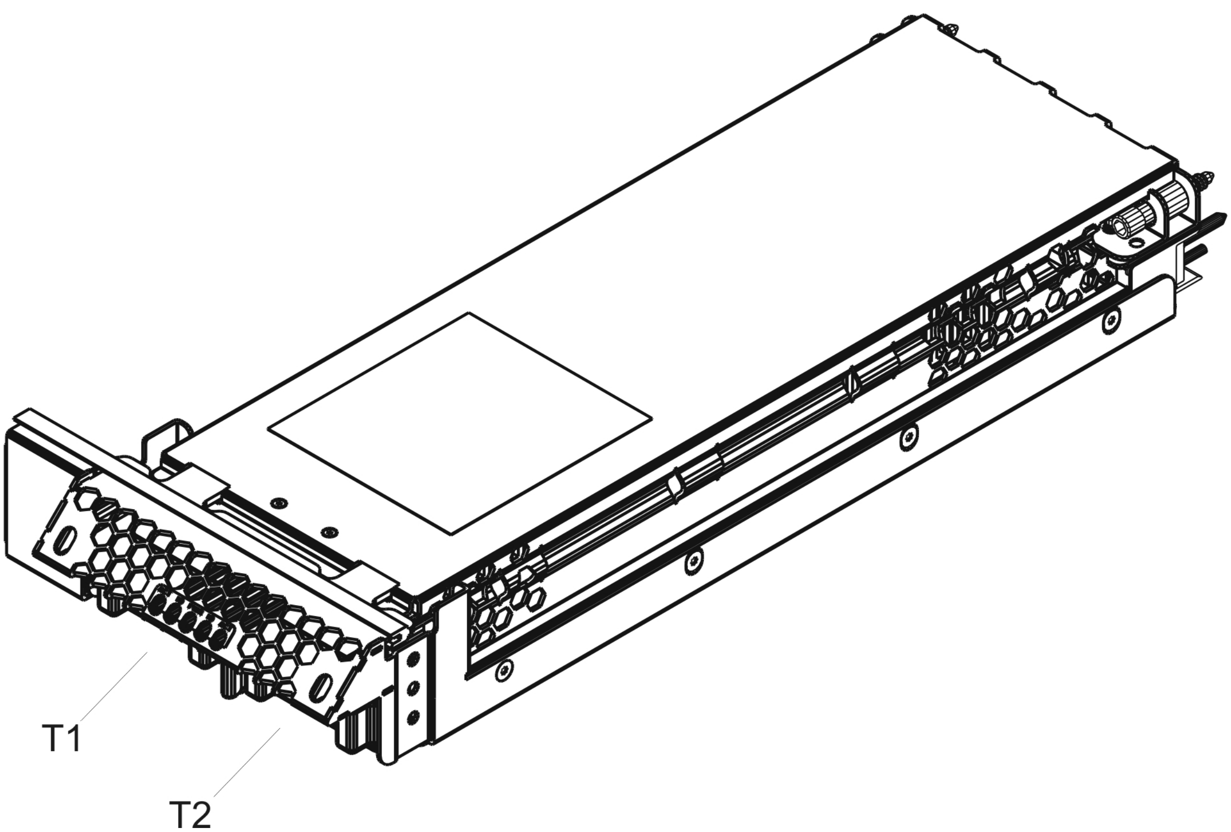


Figure 55. **FC 7910**, *2-Link SNI (p5-575 servers).*

1-Link SNI (FC 7817):

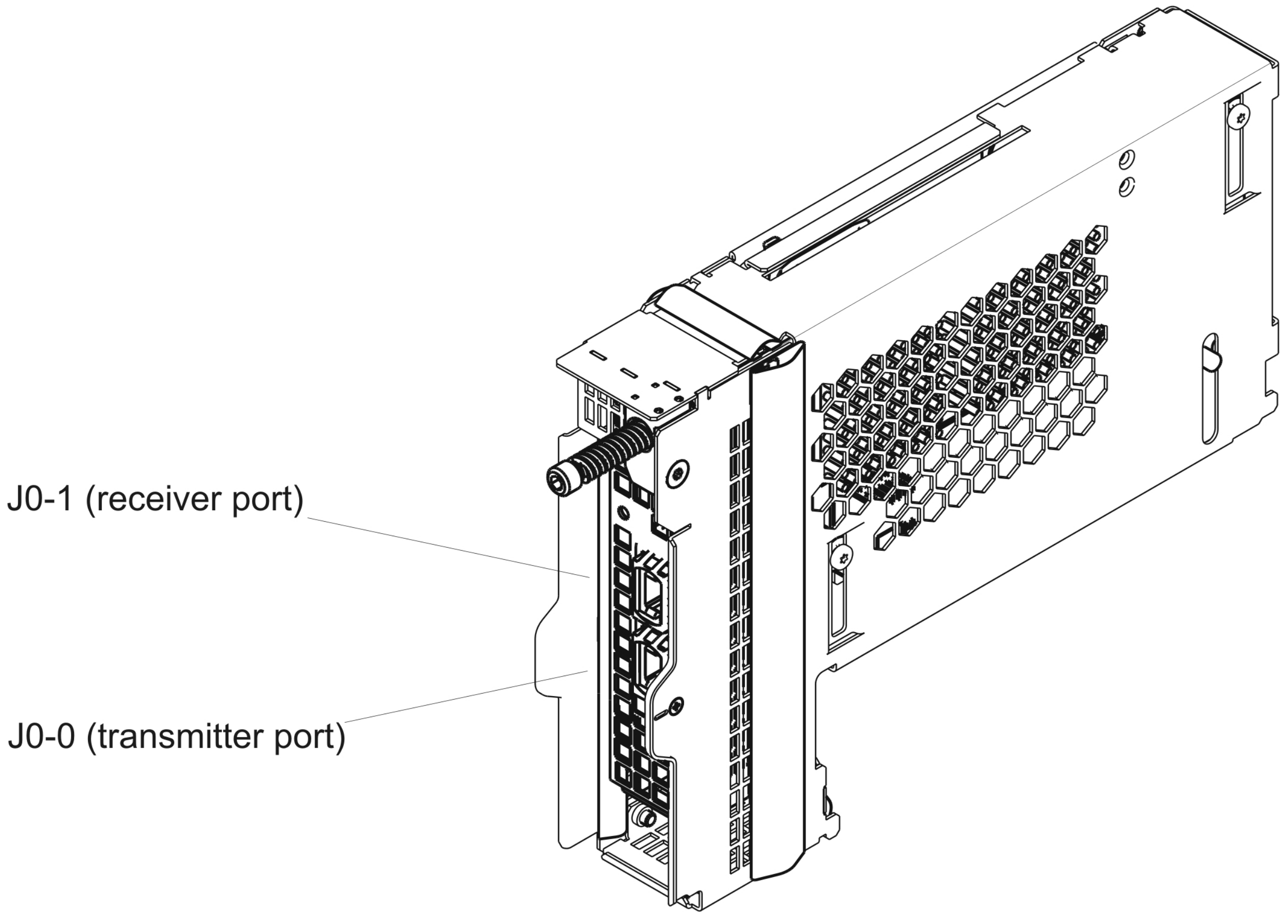


Figure 56. **FC 7817***, 1-Link SNI (p5-590 and p5-595 servers)*

Switch Port Connection card requirements

Switch Port Connection (SPC) cards are the switch-mounted risers used to connect switch cables between:

- The HPS and the SNIs mounted in the servers
- Two High Performance Switches

In general, each SNI link pair requires one switch port connections card and each pair of switch-to-switch connections requires two SPC cards. Refer to "Determining the number of Switch Port Connection cards required" on page 317 for specific details

There are three types of SPC cards (also refer to Figure 57 on page 317):

1. Copper cable (**FC 6433**)
   - Server-to-switch or switch-to-switch connections
   - Port cover required for EMC compliance on unused ports
2. Fiber optic cable (**FC 6436**)
   - Switch-to-switch connections only
   - Each fiber optic connection card has four ports; two for data input and two for data output
3. Blank (**FC 6435**)
   - Required to fill any unused switch slots and maintain proper cooling

CAUTION:
Energy hazard present. Shorting may result in system outage and possible physical injury. Remove all metallic jewelry before servicing. (C001)

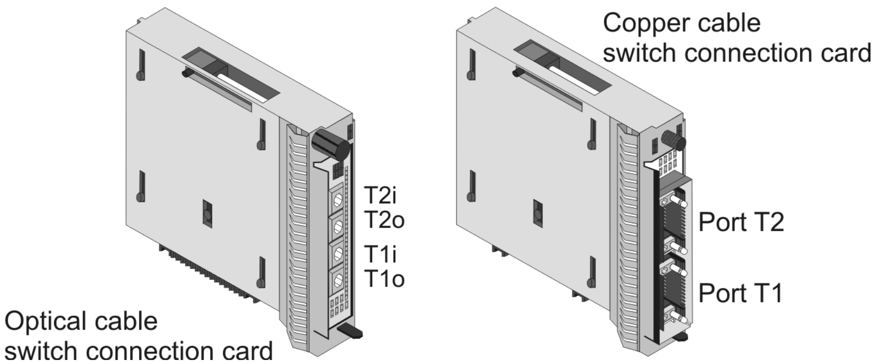


Figure 57. Switch Port Connection cards

CAUTION:
High energy present.

(L005)

Determining the number of Switch Port Connection cards required

When determining the number of Switch Port Connection (SPC) cards required, you need to calculate:

- The number of SPC cards required for server-to-switch communication (refer to "Server-to-switch")
- The number of SPC cards required for switch-to-switch communication (refer to "Switch-to-switch")

Server-to-switch: When you look at the server-to-switch part of the network from an accounting viewpoint, one SPC card is required for each pair of SNI links. However, for improved RAS characteristics the physical connections from one SNI link pair will be spread out over two SPC cards. Therefore, from a connection viewpoint it is more correct to say that two pairs of SNI links require one pair of SPC cards.

To determine the number of SPC cards required for server-to-switch links:

- Order one Switch Port Connection card for each 2-Link SNI
  - **FC 7910** 2-Link SNIs require copper cables for server-to-switch connections
  - You must order **FC 6433** Switch Port Connection cards for these SNIs
- Order one Switch Port Connection card for each pair of 1-Link SNIs
  - **FC 7817** 1-Link SNIs require fiber optic cables for server-to-switch connections
  - You must order **FC 6436** Switch Port Connection cards for these SNIs

Switch-to-switch: Switch Port Connection cards used for switch-to-switch communication follow a set of configuration rules. Therefore the number of SPC cards required for each network can be predetermined. Table 75 on page 318 lists these requirements. Although the number of SPC cards can be predetermined, the following rules must be followed for switch-to-switch configurations:

- If your system has two or more NSBs on a switch network, all switch-to-switch slots on the NSBs must be populated with SPC cards (refer to Figure 58 on page 319).
- If your system has two or more NSBs on a switch network, all switch-to-switch, SPC cards on the NSBs must be cabled as described in the configuration tables even if some server-to-switch connection slots are unused and populated with blank cards.
- If your system has four or more NSBs on a switch network, the network also requires ISBs. All SPC cards on an ISB are configured for switch-to-switch communication by default. ISBs may have unused SPC card slots but they must be plugged with blank cards to maintain cooling.
- Unless required by configuration rules, all SPC cards used for switch-to-switch communication on ISBs must be fully cabled to other switches in the system.
- Any unused port on a copper cable SPC card must have a port cover installed for EMC compliance.
- When using fiber optic cables for *switch-to-switch* connections, the output port on the first SPC card (for example T1o on card A) must be plugged into the corresponding input port on the associated SPC card (T1i on card B). In addition, the input port on the first SPC card (T1i on card A) must be plugged into the corresponding output port on the associated SPC card (T1o on card B).

Table 75. Switch Port Connection cards required for switch-to-switch connections

Network configuration	Switch boards in network	NSB Switch Port Connection card requirements	ISB Switch Port Connection card requirements	Total number of switch-to-switch, Switch Port Connection cards required
Single network system	2 NSBs	8 per NSB x 2 = 16	0	16
	3 NSBs	8 per NSB x 3 = 24	0	24
	4 NSBs + 2 ISBs	8 per NSB x 4 = 32	8 per ISB x 2 = 16	48
	5 NSBs + 4 ISBs	8 per NSB x 5 = 40	12 per ISB x 4 = 48	88
	6 NSBs + 4 ISBs	8 per NSB x 6 = 48	12 per ISB x 4 = 48	96
	7 NSBs + 4 ISBs	8 per NSB x 7 = 56	16 per ISB x 4 = 64	120
	8 NSBs + 4 ISBs	8 per NSB x 8 = 64	16 per ISB x 4 = 64	128
Dual network system	2 NSBs (one per network)	8 per NSB x 2 = 16	0	16
	4 NSBs (two per network)	8 per NSB x 4 = 32	0	32
	6 NSBs (three per network)	8 per NSB x 6 = 48	0	48
	8 NSBs + 4 ISBs (four + two per network)	8 per NSB x 8 = 64	16 per ISB x 4 = 64	128
	16 NSBs + 8 ISBs (eight + four per network)	8 per NSB x 16 = 128	16 per ISB x 8 = 128	256
Note: This table lists the requirements for switch-to-switch connections. The total number of Switch Port Connection cards required for the network will be the number required for switch-to-switch communication plus the number required for server-to-switch communication.				

Switch-to-switch connections may use either copper cables or fiber optic cables; each cable type requires a specific Switch Port Connection card:

- For copper switch cables, order **FC 6433** Switch Port Connection cards
  – Each **FC 6433** SPC card uses the following cable options:
    - **FC 3161**: 1.2 m copper switch cables
    - **FC 3166**: 3 m copper switch cables
    - **FC 3167**: 10 m copper switch cables
- For fiber optic switch cables, order **FC 6436** Switch Port Connection cards
  – Each **FC 6436** SPC card uses the following cable options:
    - **FC 7923**: 3.5 m fiber optic switch cable pairs
    - **FC 7962**: 10 m fiber optic switch cable pairs
    - **FC 3256**: 20 m fiber optic switch cable pairs
    - **FC 7963**: 30 m fiber optic switch cable pairs
    - **FC 3257**: 40 m fiber optic switch cable pairs

Notes:

1. The 1.2 m copper cable option is used for switches mounted in the first frame slot.
2. All feature codes for fiber optic cables returns one pair of cables.
3. Figure 57 on page 317 shows four ports on the optical cable connector. Two of these ports are for data output (T1i and T2i) and two are for data input (T1o and T2o).

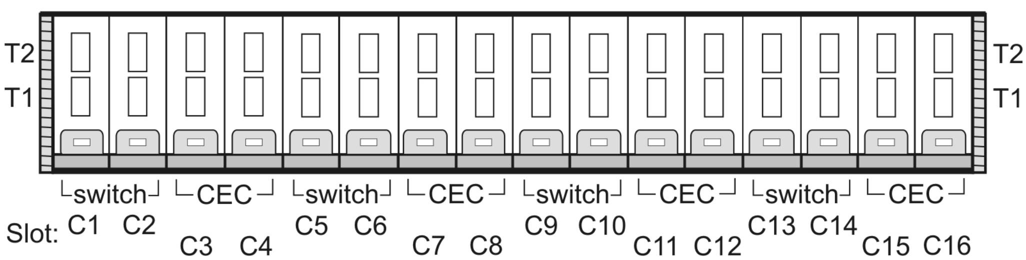


Figure 58. NSB Switch Port Connection card slot identification

Determining the number of High Performance Switches required

The number of links supported on a network depends on the number of switches used in the network. However, some network configurations, such as the number of networks in the system, require more switches to support the same number of links than other configurations require. The trade-off is cost verse ease of expansion and service. "Standard switch configurations" list network options and Table 76 on page 320 summarizes the number of links supported for each option.

Standard switch configurations

The standard switch configurations for a HPS network include:

- Single network systems
  – One switch configured as a Node Switch Board (NSB), no Intermediate Switch Boards (ISBs)
  – Two switches configured as NSBs, no ISBs
  – Three switches configured as NSBs, no ISBs
  – Four switches configured as NSBs plus two switches as ISBs
  – Five switches configured as NSBs plus four switches as ISBs
  – Six switches configured as NSBs plus four switches as ISBs
  – Seven switches configured as NSBs plus four switches as ISBs
  – Eight switches configured as NSBs plus four switches as ISBs
- Dual network systems
  – Two switches configured as NSBs (one NSB switch per network)
  – Four switches configured as NSBs (two NSB switches per network)

– Six switches configured as NSBs (three NSB switches per network)
– Eight switches configured as NSBs plus four switches as ISBs (four NSB and two ISB switches per network)
– Sixteen switches configured as NSBs plus eight switches as ISBs (eight NSB and four ISB switches per network)

Note: Using the special bids process, you can order larger networks in either configuration.

Supported link configurations

Table 76 lists the maximum number of links allowed in each supported network configuration and the number of switches required to support those links.

Table 76. Switch requirements for link configurations

Network configuration		Maximum number of links supported
Single network system	**Dual network system**	
One NSB	Not available	16 links
Two NSBs	One NSB per network	32 links
Three NSBs	Not available	48 links
Four NSBs + two ISBs	Two NSBs per network	64 links
Five NSBs + four ISBs	Not available	80 links
Six NSBs + four ISBs	Three NSBs per network	96 links
Seven NSBs + four ISBs	Not available	112 links
Eight NSBs + four ISBs	Four NSBs + two ISBs per network	128 links
Not available	Eight NSBs + four ISBs per network	256 links

Switch cable requirements

DANGER

Electrical voltage and current from power, telephone, and communication cables are hazardous.

To avoid a shock hazard:

- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**
- **Connect all power cords to a properly wired and grounded electrical outlet. Ensure outlet supplies proper voltage and phase rotation according to the system rating plate.**
- **Connect any equipment that will be attached to this product to properly wired outlets.**
- **When possible, use one hand only to connect or disconnect signal cables.**
- **Never turn on any equipment when there is evidence of fire, water, or structural damage.**
- **Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.**
- **Connect and disconnect cables as described below when installing, moving, or opening covers on this product or attached devices.**

  To Disconnect:

  1. **Turn everything OFF (unless instructed otherwise).**
  2. **Remove power cords from the outlet.**
  3. **Remove signal cables from connectors.**
  4. **Remove all cables from devices.**

  To Connect:

  1. **Turn everything OFF (unless instructed otherwise)**
  2. **Attach all cables to devices.**
  3. **Attach signal cables to connectors.**
  4. **Attach power cords to outlet.**
  5. **Turn device ON.**

  (D005)

HPS network cable requirements are classified as either server-to-switch requirements or switch-to-switch requirements. All networks require server-to-switch cables. However, network configurations having one NSB per network do not require switch-to-switch cables. Table 78 on page 322 summarizes the available switch cables for each application.

1. The total number of switch cables required for a network is the sum of the number of switch-to-switch cables required plus the number of server-to-switch cables required
2. For server-to-switch communication, the total number of switch cables required is equal to the number of links in the configuration
   - Each 2-Link SNI requires two copper switch cables
   - Each 1-Link SNI *pair* requires one pair of fiber optic switch cables
     – Each fiber optic cable feature code returns one pair of switch cables
3. For switch-to-switch communication, the number of switch cables required is dependent on the number of NSBs in the system and the number of networks in the system, Table 77 on page 322 list these requirements
   - Unless required by configuration rules, all SPC cards used for switch-to-switch communication on ISBs and NSBs must be fully cabled

- Each copper cable SPC card can have one or two cables attached
- Each fiber optic cable SPC card can have one or two cable **pairs** attached
  – Each feature code for fiber optic cables delivers one pair of fiber optic cables
  – One cable of the pair is used for data output
  – The other cable of the pair is used for data input
  – The data output cable from the first switch port connection is the data input cable for the second (associated) SPC card

Table 77. Switch-to-switch cable requirements

NSBs in network	**Switch-to-switch cables required**	
	Single network configurations	**Dual network configurations**
One NSB	0	Not available
Two NSBs	16	0
Three NSBs	24	Not available
Four NSBs	64	32
Five NSBs	80	Not available
Six NSBs	96	48
Seven NSBs	112	Not available
Eight NSBs	128	128
Sixteen NSBs	Not available	256

Notes:

1. If fiber optic cables are used for switch-to-switch communication, the number listed is the number of fiber optic cable **pairs** required.
2. Switch-to-switch cables are shared between switches and the total number of switch-to-switch cables is not the same as the number of switch-to-switch cables attached to each switch.

Table 78. Switch cable data

Cable type	**Cable length**	**Feature code**
Copper cables	1.2 m (3.9 ft.)	**FC 3161**
	3 m (7.2 ft.)	**FC 3166**
	10 m (32.8 ft.)	**FC 3167**
Fiber optic cables (Each FC returns one fiber optic cable pair)	3.5 m (11.5 ft.)	**FC 7923**
	10 m (32.8 ft.)	**FC 7962**
	20 m (65.6 ft.)	**FC 3256**
	30 m (98.4 ft.)	**FC 7963**
	40 m (131.2 ft.)	**FC 3257**

Flexible network options

Configuration flexibility a major benefit of the HPS network. For example:
- NSBs may be located in p5-575, p5-590, and p5-595 server racks
- NSBs and ISBs may be mixed together in switch-only racks

However, flexibility also requires careful planning; not only for the current network but also for your future network requirements. Some planning issues related to network flexibility that you need to consider include:

Placing switches in server racks

The advantage of placing switches into server racks include: not having to buy switch-only frame, saving floor space, fewer electrical runs, and fewer supervisory network connections. As part of the planning process, you need to balance the savings with the following:

- If you are placing the switches into existing server racks, you may have to relocate servers or I/O drawers to open up the rack slot required by the HPS. Will that cause unacceptable network interruptions?
- If you have to relocate hardware, will your existing cables have enough slack or be easily moved to the new rack slot?
- What problems will you encounter pulling switch cables into the existing rack?
- If you are going to expand the network in the future, will you have room to pull new switch cables into the server rack?
- If you are going to expand the network in the future, you may need a switch-only rack at that time. Would it be advantageous to configure the system with a switch-only rack now instead of using available server rack slots?
- If you are going to use switch-only rack in your current configuration, would it be advantageous to order the extra switch cables and place all switches in the switch-only rack instead of using available server rack slots?

Switch placement in switch-only racks

If you are configuring your system with a switch-only rack:

- Consider adding a frame extender (**FC 6234**) to accommodate future switch cable bundles
- Order switch cable lengths that will leave slack length to simplify relocating switches within the rack

Locating Switch Port Connection cards in the switch

Switch Port Connection cards must be installed using specific ordering sequences. For:

- SPC cards used for switch-to-switch communication, refer to “Installing ISB Switch Port Connection cards” on page 329
- SPC cards used for server-to-switch communication, refer to “Installing NSB Switch Port Connection cards” on page 330

Note: If your system has a mix of fiber optic and copper cable SPC cards configured for server-to-switch communication, you must work with your special bids representative. Mixing fiber optic and copper server-to-switch cables creates installation planning requirements for nodes and SPC cards. By carefully planning node installation order, you can arrange the system configuration so that fiber optic SPC cards and copper cable SPC cards are grouped into configurations that will allow proper switch cable distribution.

Cable maintenance

As your network grows, cable requirements increase significantly. To minimize network downtime, consider the following options:

- Configure the network with an optional switch-only rack
- Add a frame extender to switch-only racks
- Order cables with lengths that will leave slack for relocation
- Pull extra cables during the initial configuration for use with future network expansions

Installing switch network connection components

This section provides information on installing components for connecting switches and servers across the network. These components include:

- Switch Network Interfaces
- Switch Port Connection cards
- Switch cables

Before you begin installing network components make certain that:

1. All server racks, switch-only racks, management servers, and HMCs are set in their final position
2. All switches are installed in the correct frames and frame locations
   - Verify frame numbers and the associated MTMS IDs if possible
3. The cluster service network is in place
4. For additional information on these tasks, refer to Chapter 6, “Installation,” on page 67

When the prerequisites are met, use the following information for:
- “Installing Switch Network Interfaces”
- “Installing Switch Port Connection cards” on page 326
- “Installing switch cables” on page 332

Note: The information in these sections applies to single network systems and dual network systems.

Installing Switch Network Interfaces

A Switch Network Interface must be installed in each server or server LPAR attached to the switch. There are two SNI versions:

FC 7910
2-Link SNI for p5-575 servers

FC 7817
2-Link SNI for p5-590 and p5-595 servers

Note: The information in this section applies to single network systems and dual network systems.

FC 7910

To install this 2-Link SNI (refer to Figure 55 on page 315) for p5-575 servers:
1. The SNI for the first node in the server frame must be installed in GX slot C66
2. The SNI for the second node in the server frame must be installed in GX slot C65
3. The SNI for the third node in the server frame must be installed in GX slot C66
4. The SNI for the fourth node in the server frame must be installed in GX slot C65
5. Continue alternating GX slots as you install SNIs up the frame, this requirement simplifies switch cable management

Note: When installing FC 7910 SNIs, do not rotate the SNI. The top of the SNI remains in the same position relative to the top of the node. In other words, the T1 port is always on the left side of the SNI. However, the spacer panel and EMC bracket that are attached to the SNI must be oriented correctly for each node slot. When you install the SNI in the C66 slot, the spacer panel must be installed on the left side of the SNI. When you install the SNI in the C65 slot, the spacer panel must be installed on the right side of the SNI. In addition, you must also rotate the EMC bracket into the correct position for each slot. Refer to:
- Figure 59 on page 325 for node slot locations
- Figure 60 on page 325 for the correct orientation of the spacer panel and EMC bracket for each slot location
- “Installing switch cables” on page 332 for cable attachment information

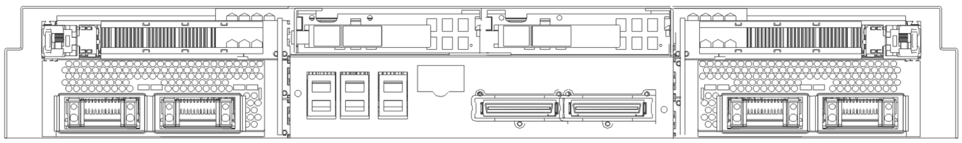


Figure 59. p5-575 server cage showing GX slots

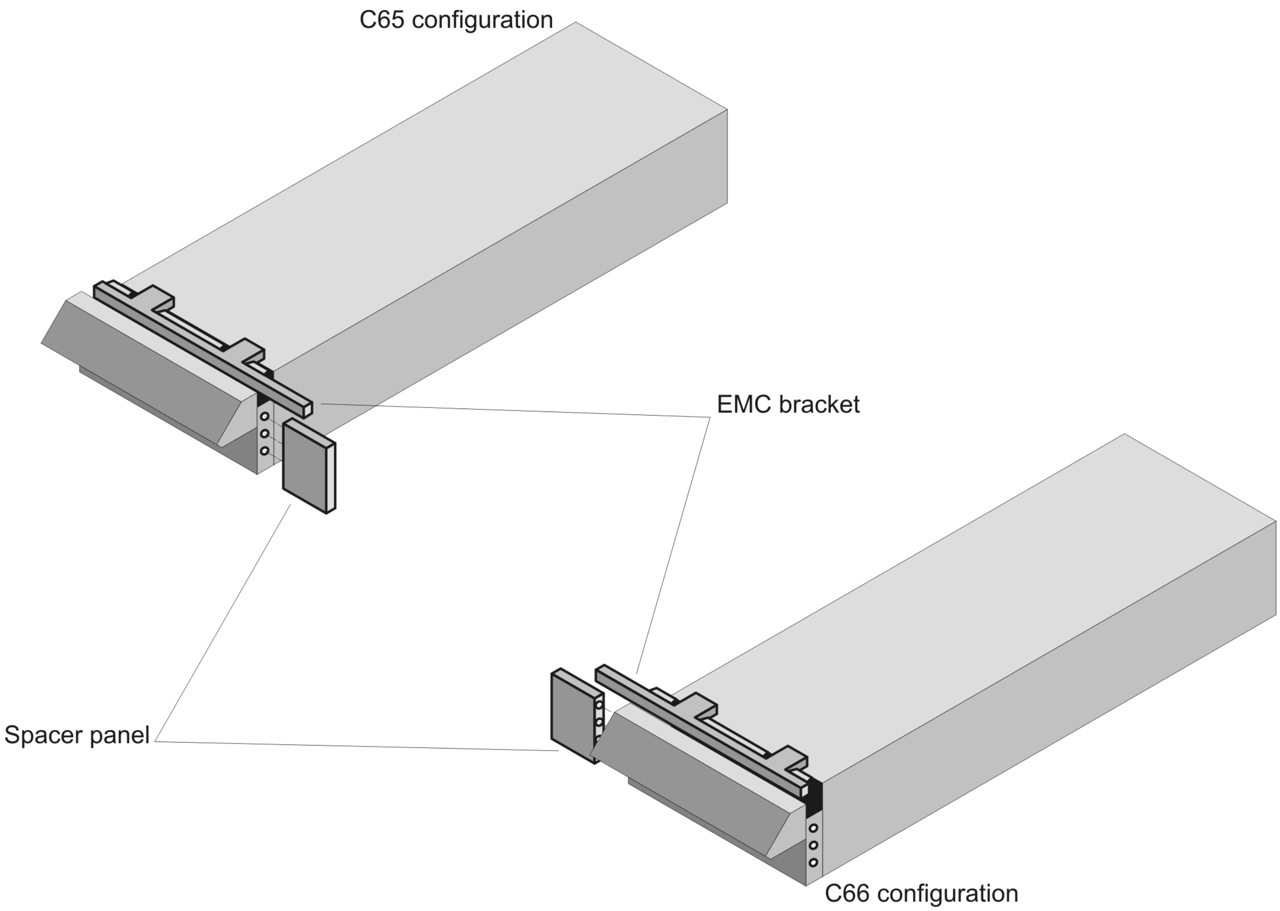


Figure 60. Spacer panel and EMC bracket orientations for FC 7910 slot locations

FC 7817

To install this 2-Link SNI (refer to Figure 56 on page 316) for p5-590 and p5-595 servers:

1. The SNIs must be installed in pairs
2. The first SNI pair must be installed in slots 8 and 9 of node slot 1 (P2)
   - Applies to p5-590 and p5-595 servers
3. The second SNI pair must be installed in slots 8 and 9 of node slot 2 (P3)
   - Applies to p5-590 and p5-595 servers
4. The third SNI pair must be installed in slots 8 and 9 of node slot 3 (P4)
   - Applies to p5-595 servers only
5. The fourth SNI pair must be installed in slots 8 and 9 of node slot 4 (P5)
   - Applies to p5-595 servers only
6. Refer to Figure 61 on page 326 for locations

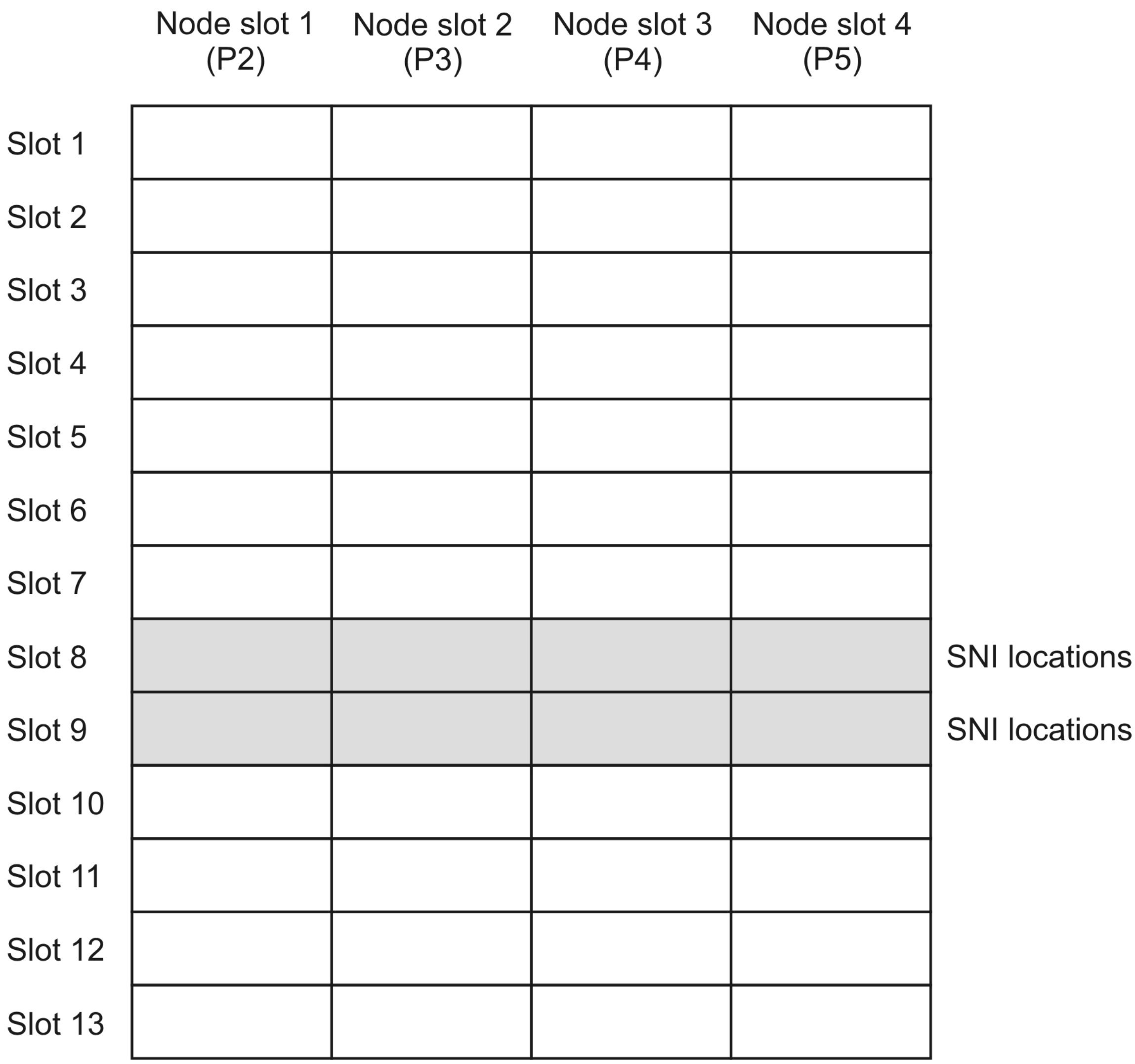


Figure 61. p5-590 and p5-595 slot locations

Installing Switch Port Connection cards

The installation order for the Switch Port Connection cards depends on switch configuration. If the HPS is configured as:

- An Intermediate Switch Board (ISB) for switch-to-switch communication, refer to, “Installing ISB Switch Port Connection cards” on page 329.
- A Node Switch Board (NSB) for server-to-switch communication, refer to, “Installing NSB Switch Port Connection cards” on page 330.

Note: The information in this section applies to single network systems and dual network systems.

There are three types of Switch Port Connection (SPC) cards (refer to Figure 62 on page 328):

FC 6435
: This is a blank SPC card required to fill any unused switch ports.

FC 6433
: This SPC card is used with copper switch cables. FC 6433 can be used for either server-to-switch

or switch-to-switch connections. Each of the two ports on this connection card is capable of bi-directional communication. Each 2-Link SNI requires the equivalent of one FC 6433 connection card.

Note: FC 6433 requires a port cover for EMC compliance on any unused cable port.

FC 6436

This SPC card is used with fiber optic switch cables. FC 6436 has four ports; two for data input and two for data output. When using FC 6436, each connection requires one *pair* of fiber optic cables (FCs 7923, 7962, 3256, 7963, and 3257). The cable connected to the output port of the first card becomes the input cable on the second card. In addition, the input cable of the first card originates at the output port of the second card.

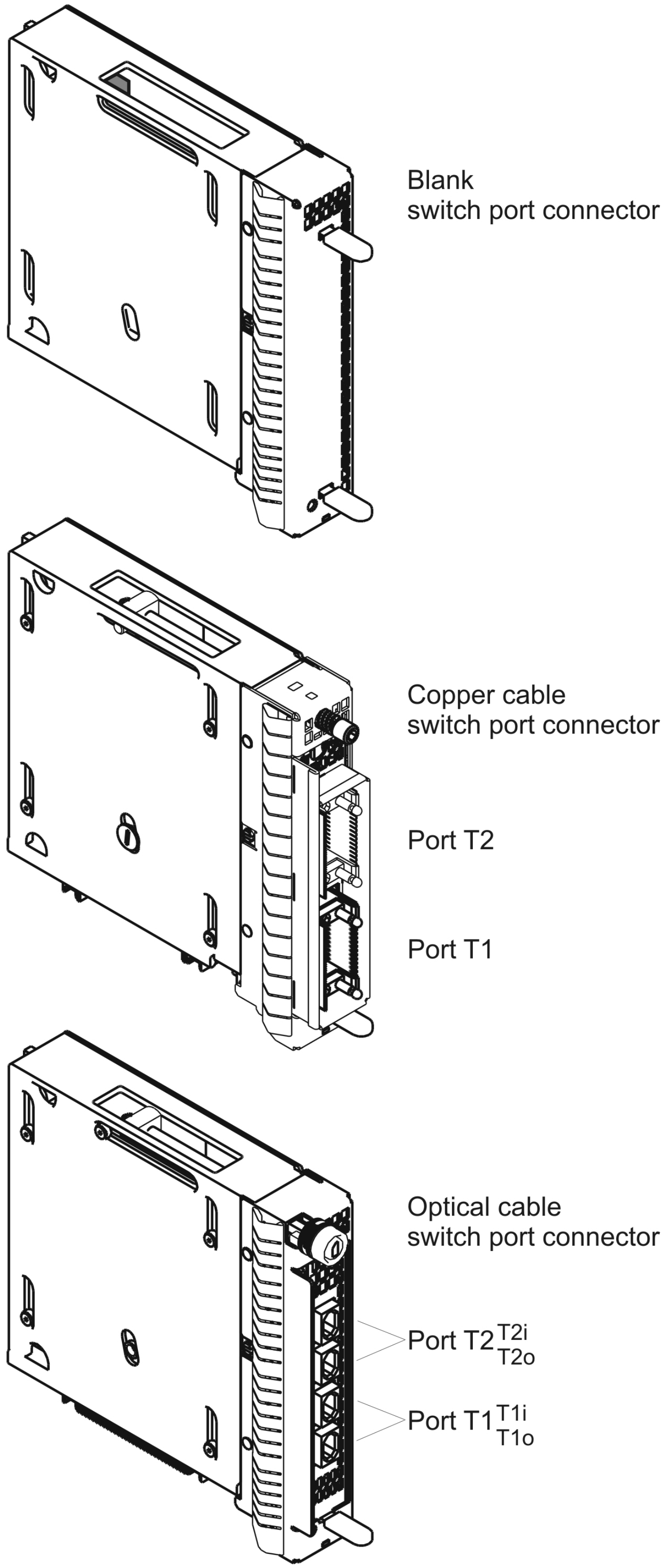


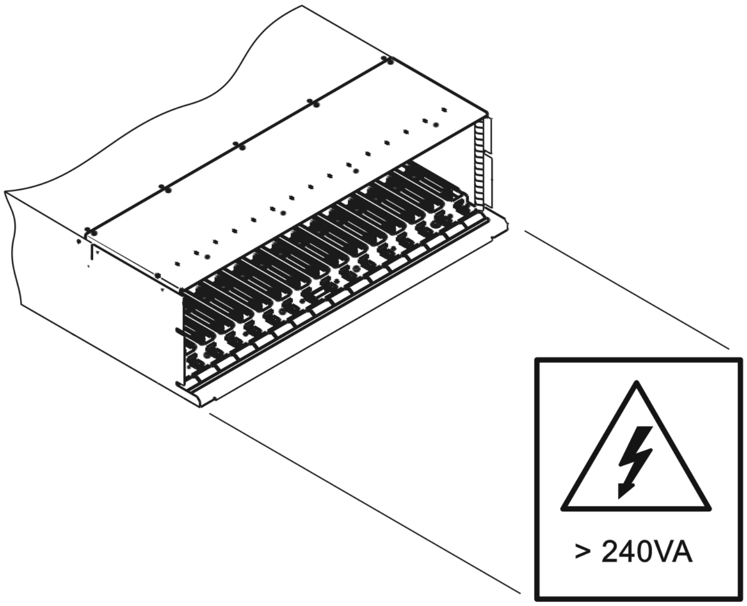
Figure 62. Switch Port Connection cards

Installing ISB Switch Port Connection cards

When a HPS is configured as an ISB, all switch slots must be used for switch-to-switch communication. Any switch slot that does not have a cabled Switch Port Connection (SPC) card installed must have a blank card installed. On an ISB, SPC cards **must** be installed in the following order:

1. Slot C1
2. Slot C2
3. Slot C5
4. Slot C6
5. Slot C9
6. Slot C10
7. Slot C13
8. Slot C14
9. Slot C3
10. Slot C7
11. Slot C11
12. Slot C15
13. Slot C4
14. Slot C8
15. Slot C12
16. Slot C16

Both **FC 6436** and **FC 6433** may be used as ISB SPC cards. When connecting switch cables to the SPC cards, use the port associations and connection order listed in “Switch-to-switch cable connections” on page 347. Refer to Figure 62 on page 328 and Figure 63 on page 330 for switch slot and port locations.



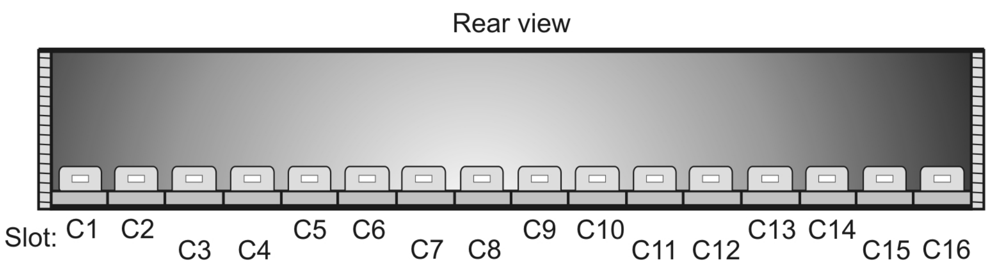


Figure 63. Switch port assignments for the HPS

Installing NSB Switch Port Connection cards

When a HPS is configured as an NSB for server-to-switch communication, the Switch Port Connection (SPC) cards must be placed in specific slots in a specific order. On the NSB, eight SPC card slots are reserved for switch-to-switch communication and eight are reserved for server-to-switch communication. Refer to Figure 64 on page 331 to see how SPC card slots are assigned for switch-to-switch and server-to-switch communication.

Note: The information in this section applies to single network systems and dual network systems.

When installing SPC cards, the following rules apply to NSBs:

- Slot pairs (1 and 2), (5 and 6), (9 and 10), and (13 and 14) are used for switch-to-switch connections
- Slot pairs (3 and 4), (7 and 8), (11 and 12), and (15 and 16) are used for server-to-switch connections
- If there is only one NSB in the system, all slots reserved for switch-to-switch communication must be populated with blank cards
- If there are two or more NSBs in the system, then all slots reserved for switch-to-switch communication must be populated and cabled to other switch-to-switch connection cards in other NSBs or ISBs

  Note: ISBs in these configurations may have open slots populated with blank cards.

- When connecting switch cables to the SPC cards, use the port associations and connection order listed in “Switch-to-switch cable connections” on page 347 and “Server-to-switch cable connections” on page 385.
- Any port on a copper cable SPC card that does not a cable attached must have a port cover installed for EMC compliance.
- The server-to-switch, SPC cards must be installed in the following order:
  1. Slot C3
  2. Slot C7
  3. Slot C11
  4. Slot C15
  5. Slot C4
  6. Slot C8
  7. Slot C12
  8. Slot C16
- Depending on your network configuration, some switch slots reserved for server-to-switch communication may not have a SPC card installed. Open slots are not allowed and these slots must have a blank card installed to maintain proper cooling.

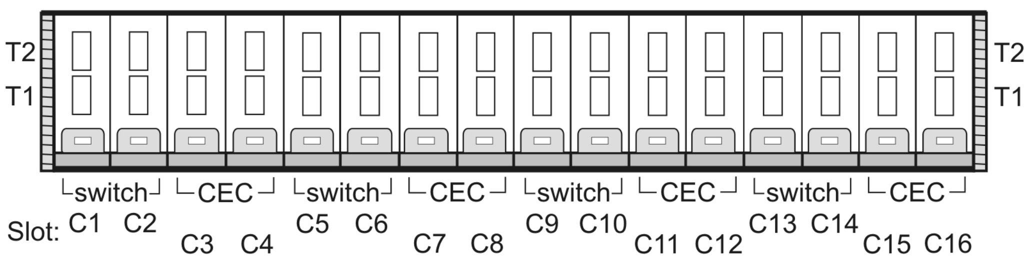


Figure 64. Switch Port Connection card slot assignments on the NSB

Installing switch cables

DANGER

Electrical voltage and current from power, telephone, and communication cables are hazardous.

To avoid a shock hazard:

- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**
- **Connect all power cords to a properly wired and grounded electrical outlet. Ensure outlet supplies proper voltage and phase rotation according to the system rating plate.**
- **Connect any equipment that will be attached to this product to properly wired outlets.**
- **When possible, use one hand only to connect or disconnect signal cables.**
- **Never turn on any equipment when there is evidence of fire, water, or structural damage.**
- **Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.**
- **Connect and disconnect cables as described below when installing, moving, or opening covers on this product or attached devices.**

  To Disconnect:

  1. **Turn everything OFF (unless instructed otherwise).**
  2. **Remove power cords from the outlet.**
  3. **Remove signal cables from connectors.**
  4. **Remove all cables from devices.**

  To Connect:

  1. **Turn everything OFF (unless instructed otherwise)**
  2. **Attach all cables to devices.**
  3. **Attach signal cables to connectors.**
  4. **Attach power cords to outlet.**
  5. **Turn device ON.**

  (D005)

Switch-to-switch cables

Switch-to-switch cables can be either fiber optic or copper cables. Refer to Table 78 on page 322 for a complete list of available cable options. Switch networks that do not require ISBs have switch-to-switch connections that pass directly from one NSB to another NSB. However, when a switch network has ISBs, all switch-to-switch connections are made between NSBs and ISBs. Switch networks with ISBs do not have direct connections between NSBs. In addition, the ISBs are also not directly connected to each other as illustrated in Figure 65 on page 333, Figure 66 on page 334, and Figure 67 on page 335.

Note: The information in this section applies to single network systems and dual network systems.

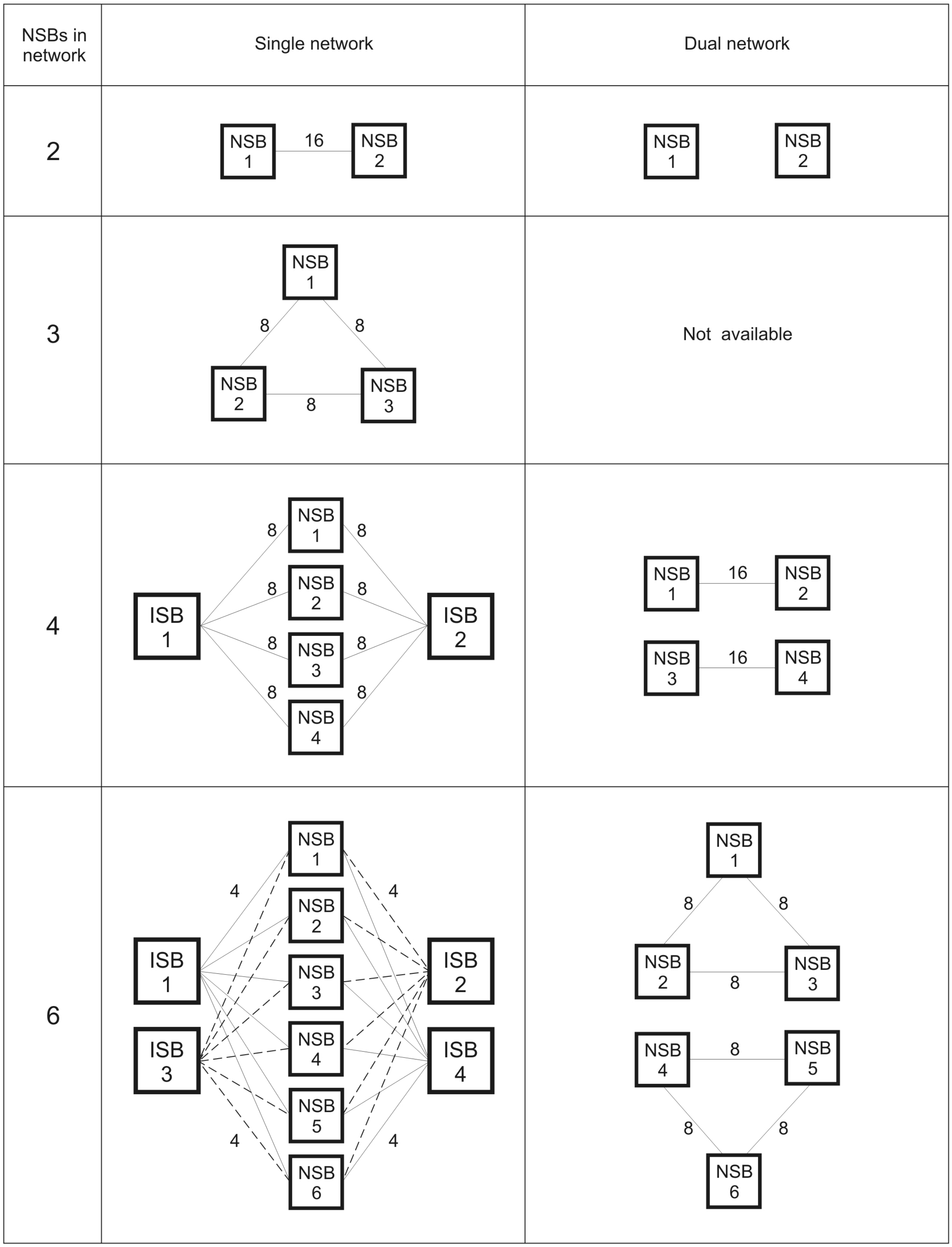


Figure 65. Typical switch-to-switch cable paths for various single and dual network configurations

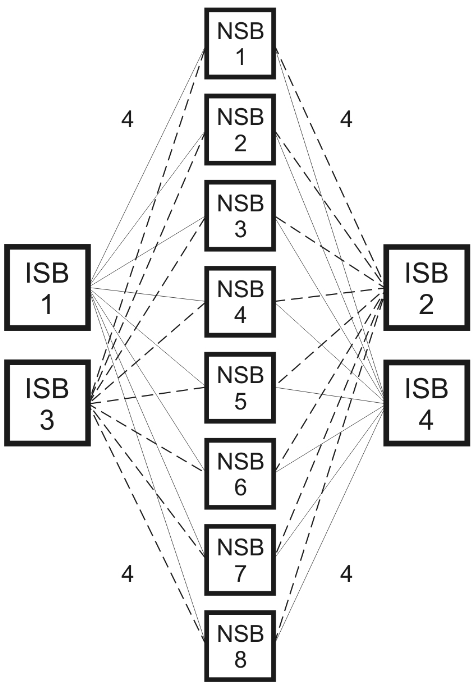
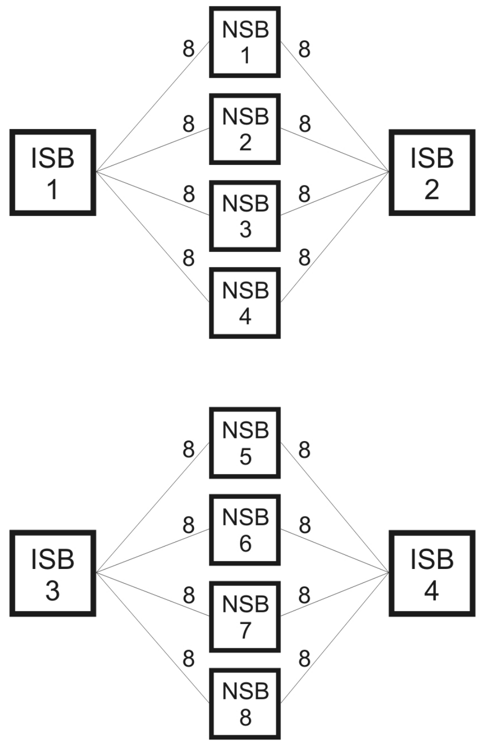
<table>
<tr><th>NSBs in network</th><th>Single network</th><th>Dual network</th></tr>
<tr><td>8</td><td>
</td><td>
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Figure 66. Typical switch-to-switch cable paths for single and dual networks with eight NSBs

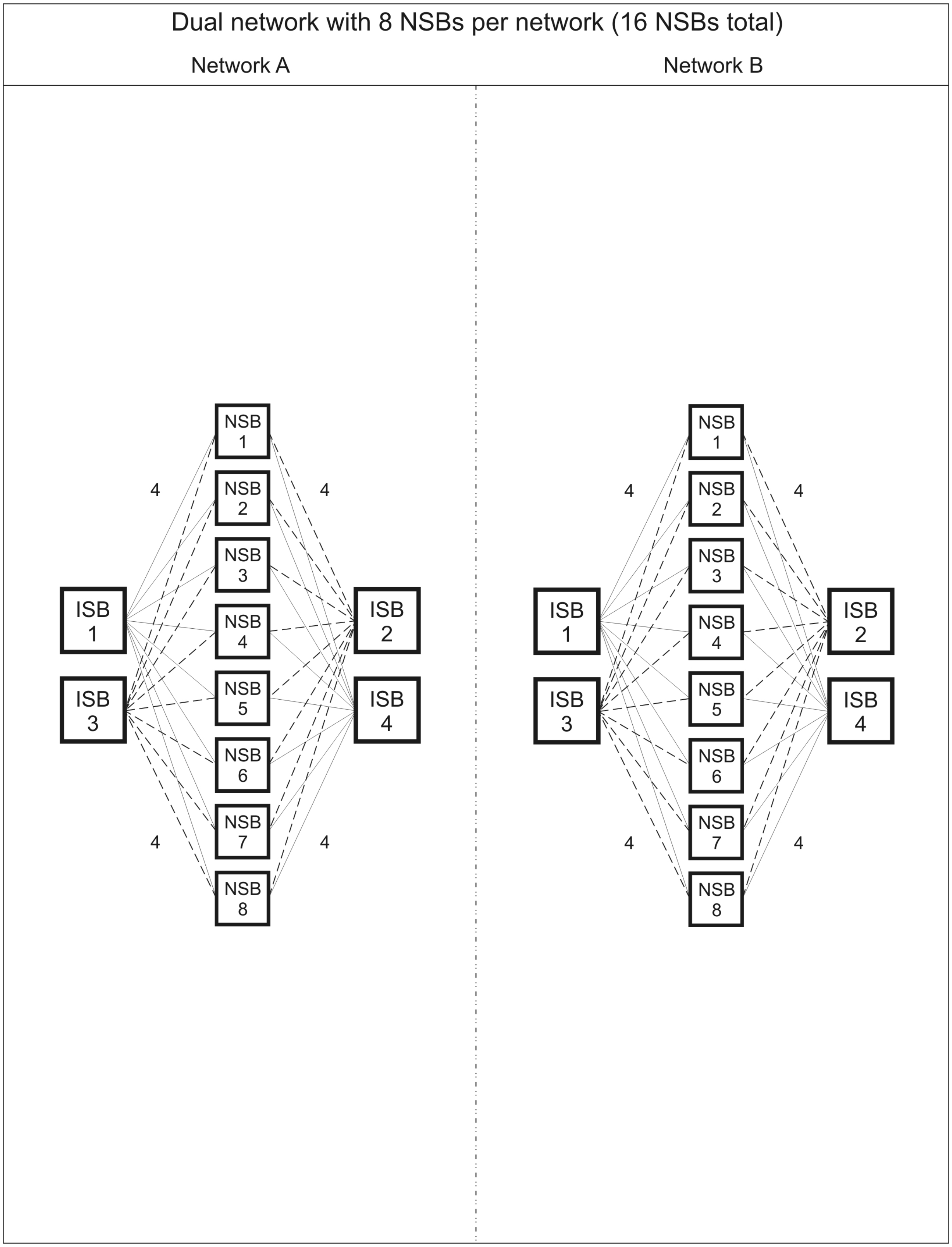


Figure 67. Typical switch-to-switch cable paths for a dual network with four ISBs per network

Installing switch-to-switch cables: The actual cable plugging locations (from-port and to-port locations) for switch-to-switch cables are defined in "Switch-to-switch cable connections" on page 347. The port locations on the Switch Port Connection cards are illustrated in Figure 68 on page 336.

- If you are using copper cables, the T1 port of the first card is connected to the T1 port on the second (associated) card.
- If you are using fiber optic cable pairs, the T1o (output) port of the first card is connected to the T1i (input) port on the second (associated) card using the first cable of the pair. In addition, the T1i (input) port of the first card is connected to the T1o (output) port on the second (associated) card using the second cable of the pair. This X connection pattern for the fiber optic cable pair also applies to the T2i and T2o ports all associated fiber optic switch-to-switch connections.

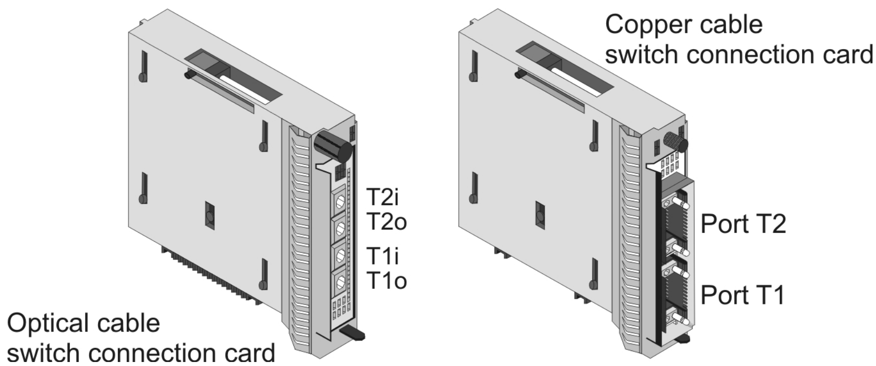


Figure 68. Switch Port Connection cards

Server-to-switch cables

There are several copper cable options for server-to-switch cables. Refer to the copper cable listings in Table 78 on page 322 for a list of available cable options.

Installing NSB switch cables: The procedures for determining the from and to port locations for server-to-switch cables are defined in "Server-to-switch cable connections" on page 385.

Appendix D. Cabling the HPS

DANGER

Electrical voltage and current from power, telephone, and communication cables are hazardous.

To avoid a shock hazard:

- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**
- **Connect all power cords to a properly wired and grounded electrical outlet. Ensure outlet supplies proper voltage and phase rotation according to the system rating plate.**
- **Connect any equipment that will be attached to this product to properly wired outlets.**
- **When possible, use one hand only to connect or disconnect signal cables.**
- **Never turn on any equipment when there is evidence of fire, water, or structural damage.**
- **Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.**
- **Connect and disconnect cables as described below when installing, moving, or opening covers on this product or attached devices.**

  To Disconnect:

  1. **Turn everything OFF (unless instructed otherwise).**
  2. **Remove power cords from the outlet.**
  3. **Remove signal cables from connectors.**
  4. **Remove all cables from devices.**

  To Connect:

  1. **Turn everything OFF (unless instructed otherwise)**
  2. **Attach all cables to devices.**
  3. **Attach signal cables to connectors.**
  4. **Attach power cords to outlet.**
  5. **Turn device ON.**

  (D005)

This appendix provides information on:

In addition to the main topics, there is a brief hardware refresher at the start of this unit.

Attention: Before you install any network components, you **must** determine the required installation locations as well as the connection endpoints for each link. The procedures in this appendix and in Appendix C, “HPS network configuration,” on page 305 will assist you with those planning tasks. The information in these appendices follows a set of rules that provide optimum distribution of links across the system. Failure to adhere to those rules will result in network errors and performance degradation.

Cabling non-standard networks

If you are cabling:

- A specialized network configuration that is not specifically described in the network planning tables, you must work with your special bids representative to make certain that all cabling issues are properly addressed.
- A network configuration that has a mix of p5-575 servers and p5-590 or p5-595 servers, you will have to make allowances for the mix of Switch Port Connection cards for fiber optic and copper switch cables. For these networks, you must work with your special bids representative to make sure that the related cabling issues are properly addressed.

Specialized network configurations

An example of a specialized network would be a single network system that will eventually require 8 NSBs. However, the initial network has less than 5 NSBs and 4 ISBs. Since a 4 ISB network with less than 5 NSBs is not fully populated, that would be a non-standard network with switch cable configuration requirements that this document does not describe. For non-standard networks, you must consider the following:

- For this specific configuration with less than 5 NSBs, you cannot plan an 8 NSB network and then simply cable the first 4 NSBs. If you took that approach, the sparse cabling will be too symmetric. For this sparse configuration, HPSNM will not be able to distinguish NSBs from ISBs during the network discovery process. If HPSNM misidentifies an ISB for an NSB or an NSB for an ISB, the routes subsequently generated for message passing will not be valid.
- For this specific configuration with less than 5 NSBs, you must cable at least two NSBs as if they were NSBs with switch numbers five through eight. By using this cable configuration, the ISB to NSB links will not be symmetric and HPSNM will not be able to distinguish ISBs from NSBs.
- Your special bids representative will provide details regarding which NSB switch number should be assigned to each NSB and how each switch should be cabled.

Mixed cable configurations

If your system has a mix of fiber optic and copper cable SPC cards *configured for server-to-switch communication*, you must work with your special bids representative.

- Mixing switch cable types creates installation planning requirements for nodes and SPC cards
- Configuration rules create these requirements because Switch Port Connection cards must be installed in a specific order (refer to “Installing Switch Port Connection cards” on page 326)
- The SPC card installation order determines the connection order for each switch cable
- Since the cable connection order is unique for each system, you must make certain the correct type of SPC card is located in the required switch slot
- By carefully planning node installation order, you can arrange the system configuration so that the switch cable connection order creates groups of server-to-switch fiber optic switch cables and groups of server-to-switch copper switch cables
- Your special bids representative will help plan these server-to-switch cable groups so that you can locate the specific SPC cards into configurations that allow proper switch cable distribution

Switch refresher

This section provides a summary of switch information that may be helpful for network cabling tasks:

Switch information

- Each HPS has 16 slots for Switch Port Connection cards
- The HPS may be configured as an ISB for switch-to-switch communication or as an NSB for server-to-switch communication

- If a Switch Port Connection card is configured for switch-to-switch communication, then all ports on that connection card must be cabled whether or not they are used (unless configuration rules require an open port)
- When configured as an NSB, the switch port slots are grouped in pairs:
  - Slots paired for switch-to-switch connections: (1 and 2), (5 and 6), (9 and 10), and (13 and 14)
  - Slots paired for server-to-switch connections: (3 and 4), (7 and 8), (11 and 12), and (15 and 16)
- Each HPS has eight switch chips and, on an NSB, each chip controls either:
  - One pair of Switch Port Connection card slots for switch-to-switch communication (switch chips 0, 1, 2, and 3)
  - One pair of Switch Port Connection card slots for server-to-switch communication (switch chips 4, 5, 6, and 7)
  - Refer to Figure 69 on page 340

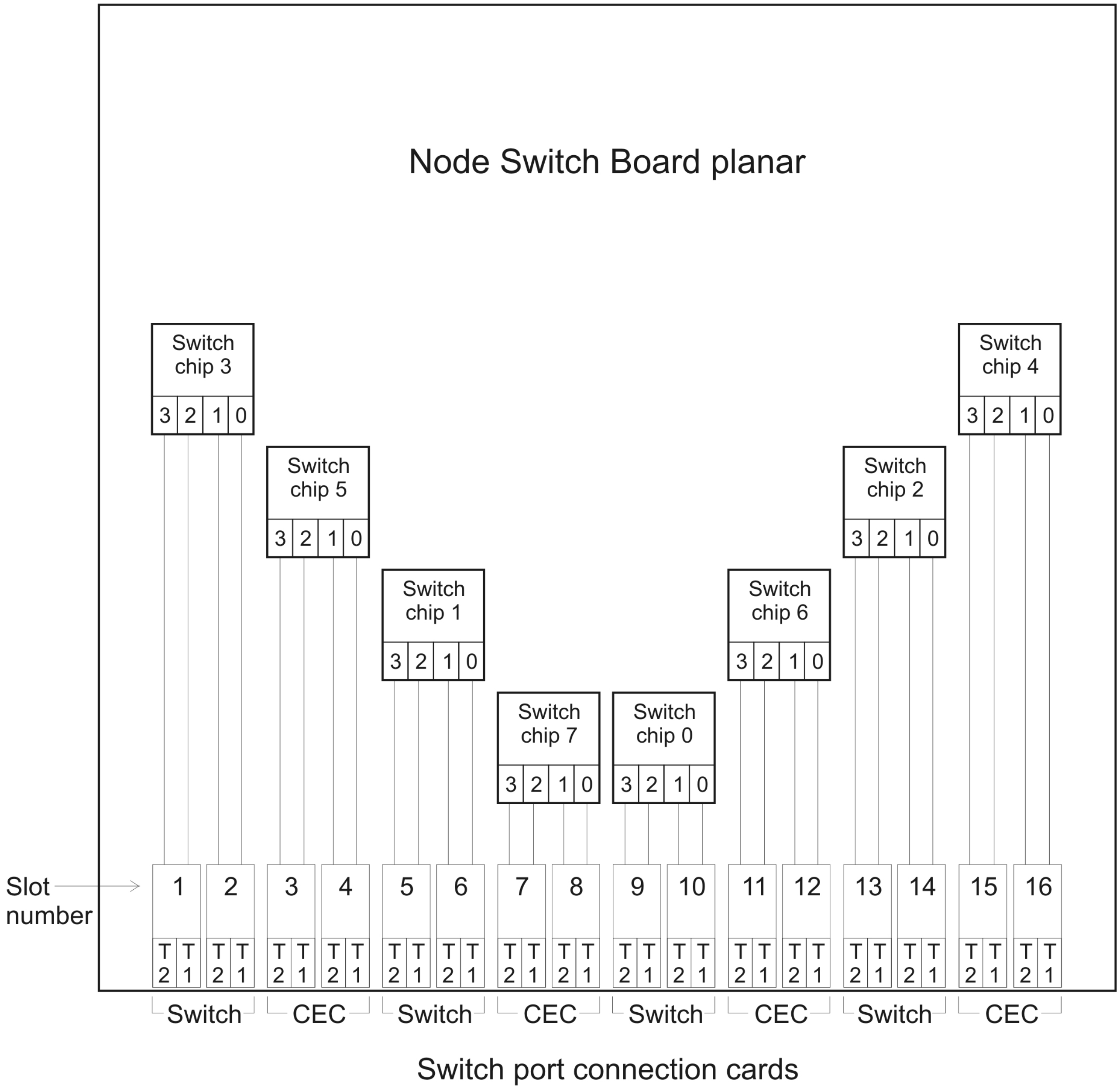


Figure 69. Switch chip to switch port associations for NSBs.

Note: Each of the eight switch chips illustrated in Figure 69 has eight switch chip ports. However, this illustration only shows switch chip ports 0, 1, 2, and 3 and their connection to the external ports on the switch planar. Since these switch chip ports are associated with external links, they are sometimes referred to as offboard links. Switch chip ports 4, 5, 6, and 7 are not shown. Switch chip ports 4, 5, 6, and 7 are used for communication between switch chips. Since these switch chip ports are used for internal links, they are sometimes referred to as onboard links.

Cable information

- On an NSB, the server-to-switch cables are installed left to right across the available SPC cards (looking at the connectors) using the following order:
  – T1 port
  – T2 port
- Unless required by configuration rules, all SPC cards used for switch-to-switch communication on both ISBs and NSBs must be fully cabled.

- Fiber optic SPC cards have four connectors. Both the T1 and T2 ports on these connection cards are divided into input ports (T1i and T2i) and output ports (T1o and T2o). When using fiber optic cables for switch-to-switch communication, the cable pair connecting the associated SPC cards uses an X pattern. For example, if you have three SPC cards (A, B, and C), the connections from A to B are: (T1oA to T1iB) and (T1iA to T1oB). The other port connectors are used to connect A to C and these connections are: (T2oA to T2iC) and (T2iA to T2oC).

Switch-to-switch cable connections

Note: This section provides information on switch-to-switch cabling. Please refer to “Server-to-switch cable connections” on page 385 for information on making those connections.

Issues that you must consider when planning switch cable connections include:

1. Determining the number of switch-to-switch cables required
2. Determining the length of required cables
3. Placing cables to reduce noise from other switch cables and ac sources
4. Making certain that your raised floor is high enough to contain all cables
5. Placing cables so that cooling air flow is unrestricted through raised floor space
6. Labeling and laying cables in an orderly manner, to allow for improved maintenance and reduced risk of mechanical failure
7. Placing cables and frames to allow for system growth

Labeling switch cables

All fiber optic and copper switch cables are provided with pre-attached blank labels on each end of the cable. Use these labels to document the serial number for each cable. However, fiber optic cables differ from copper cables in that fiber optic cables are supplied in pairs and must be labeled in pairs. Therefore each copper switch cable will have a unique serial number while both cables of a fiber optic pair must share the same serial number.

Another difference between copper cables and fiber optic cables is that copper cables use duplex data transmission. Each copper cable carries both input and output data. In contrast, fiber optic cables are delivered in pairs because data can only travel in one direction over each cable. Therefore, one fiber optic cable connects the **output** port of the first SPC card to the **input** port of the second associated SPC card. To complete the duplex data circuit, the second fiber optic cable of the pair connects the **input** port of the first card to the **output** port of the second card (refer to Figure 70 on page 342).

Because each end of the fiber optic cable provides either an output or an input function, each end of the fiber optic cable needs to have a specific designation. While both cables of the pair will have the same serial number, one connector on each cable must be labeled as the data input end and the connector on the other end of that cable must be labeled as the output end.

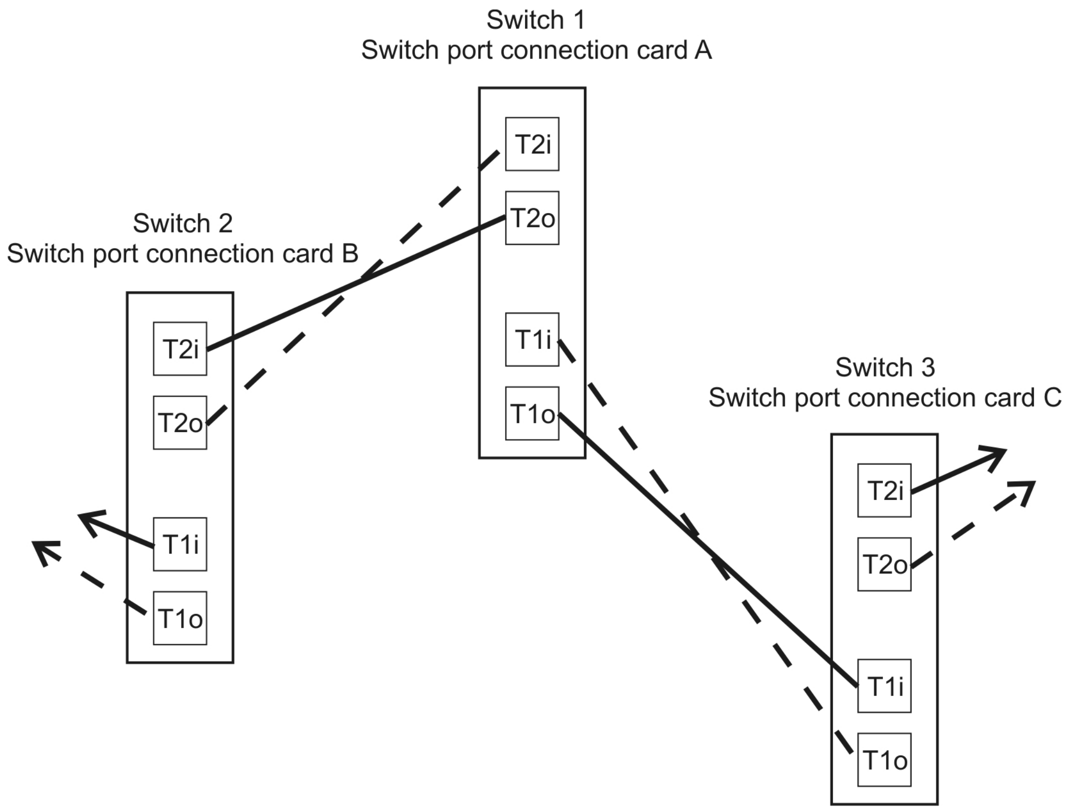


Figure 70. Cable pattern for fiber optic switch-to-switch cable pairs

Determining the number of Switch Port Connection cards and switch cables required for switch-to-switch communication

Unless required by configuration rules, **all** Switch Port Connection (SPC) cards used for switch-to-switch communication on both ISBs and NSBs must be fully cabled. As a result, the number of connections required for a each supported network configuration can be predetermined. Table 79 lists the copper cable (or fiber optic cable pair) and SPC card requirements for switch-to-switch communication on each supported network configuration.

Note: The **total** number of cables required for a system will be the sum of the number of switch-to-switch cables (or cable pairs) listed in Table 79 plus the number server-to-switch cables that you will determine later. Also, the total number of SPC cards required for a system is the number of SPC cards listed in Table 79 plus the number of SPC cards required for server-to-switch connections (also determined later).

Table 79. Switch-to-switch hardware requirements

NSBs in network	Switch-to-switch cables (or cable pairs) required		Switch Port Connection cards required for switch-to-switch connections	
	Single network configuration	Dual network configuration	Single network configuration	Dual network configuration
One NSB	0	Not available	0	Not available
Two NSBs	16	0	16	0
Three NSBs	24	Not available	24	Not available
Four NSBs	64	32	64	32

Table 79. Switch-to-switch hardware requirements (continued)

NSBs in network	Switch-to-switch cables (or cable pairs) required		Switch Port Connection cards required for switch-to-switch connections	
	Single network configuration	**Dual network configuration**	**Single network configuration**	**Dual network configuration**
Five NSBs	80	Not available	88	Not available
Six NSBs	96	48	96	48
Seven NSBs	112	Not available	120	Not available
Eight NSBs	128	128	128	128
Sixteen NSBs	Not available	256	Not available	256

Notes:

1. Switch-to-switch cables are shared between switches and the total number of switch-to-switch cables may not be the same as the number of SPC cards required for some configurations.
2. The assignment of SPC cards to ISBs and NSBs is described in "Switch-to-switch cable connections" on page 347.
3. When you order fiber optic cables, each feature code delivers one pair of cables.

Switch-to-switch cable path illustrations

The illustrations in this section provide a high level comparison of the cable configurations required for several single network systems and dual network systems. These comparisons include:

- Figure 71 on page 344 shows the cable differences for networks having a total of up to six NSBs
- Figure 72 on page 345 shows the cable differences for networks having a total of eight NSBs in the system
- Figure 73 on page 346 shows the cable distribution for dual network systems having a total of eight NSBs per network

You will need to use the information in "Switch-to-switch cable connections" on page 347 to determine the actual connection points for each cable. In addition, you must use the information in "Determining frame spacing for frame-to-frame switch cables" on page 385 to calculate cable lengths for inter-frame switch-to-switch cables.

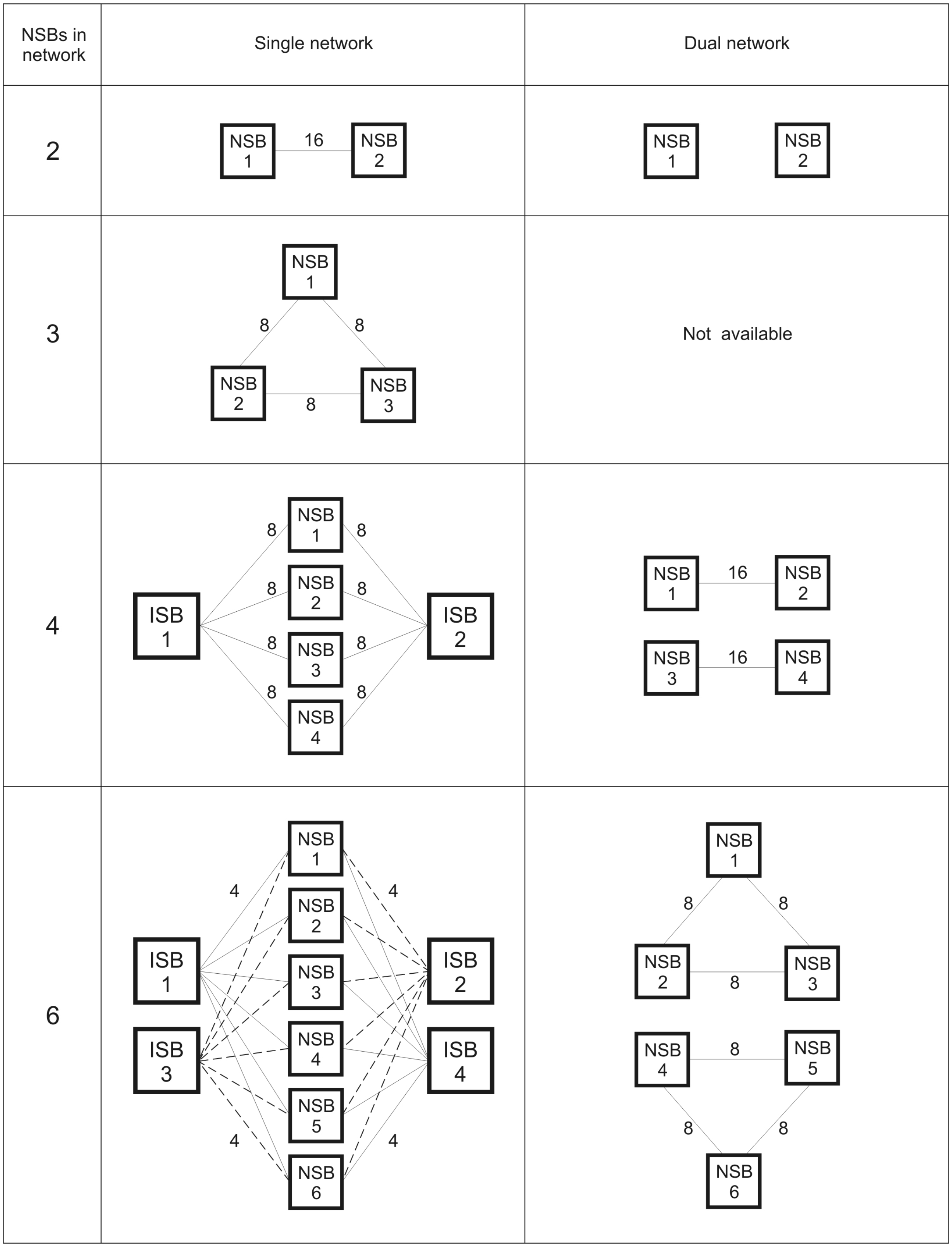


Figure 71. Switch cable paths for two, three, four, and six NSB networks. The numbered squares represent the switch boards and the lines represent the cable sets connecting them. The number above each line states the quantity of individual cables in each group (server-to-switch cables are not shown).

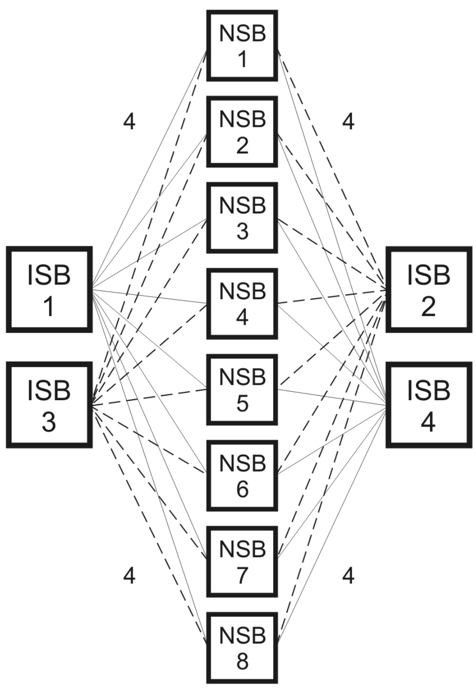
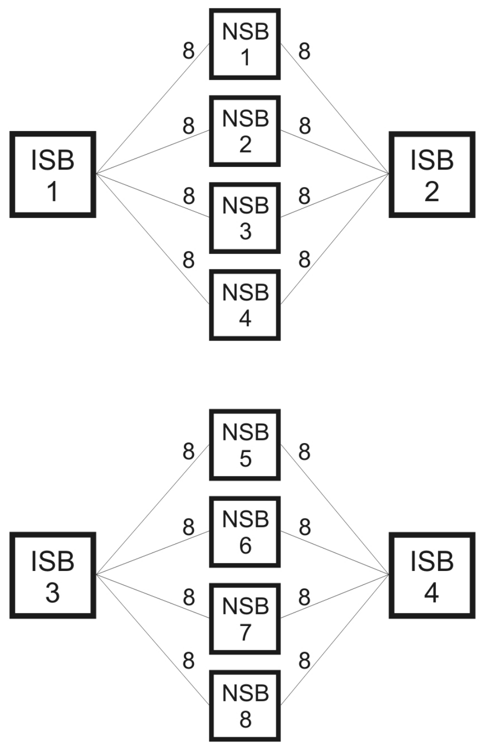
NSBs in network	Single network	Dual network
8		

Figure 72. Switch cable paths for networks with eight NSBs and four ISBs

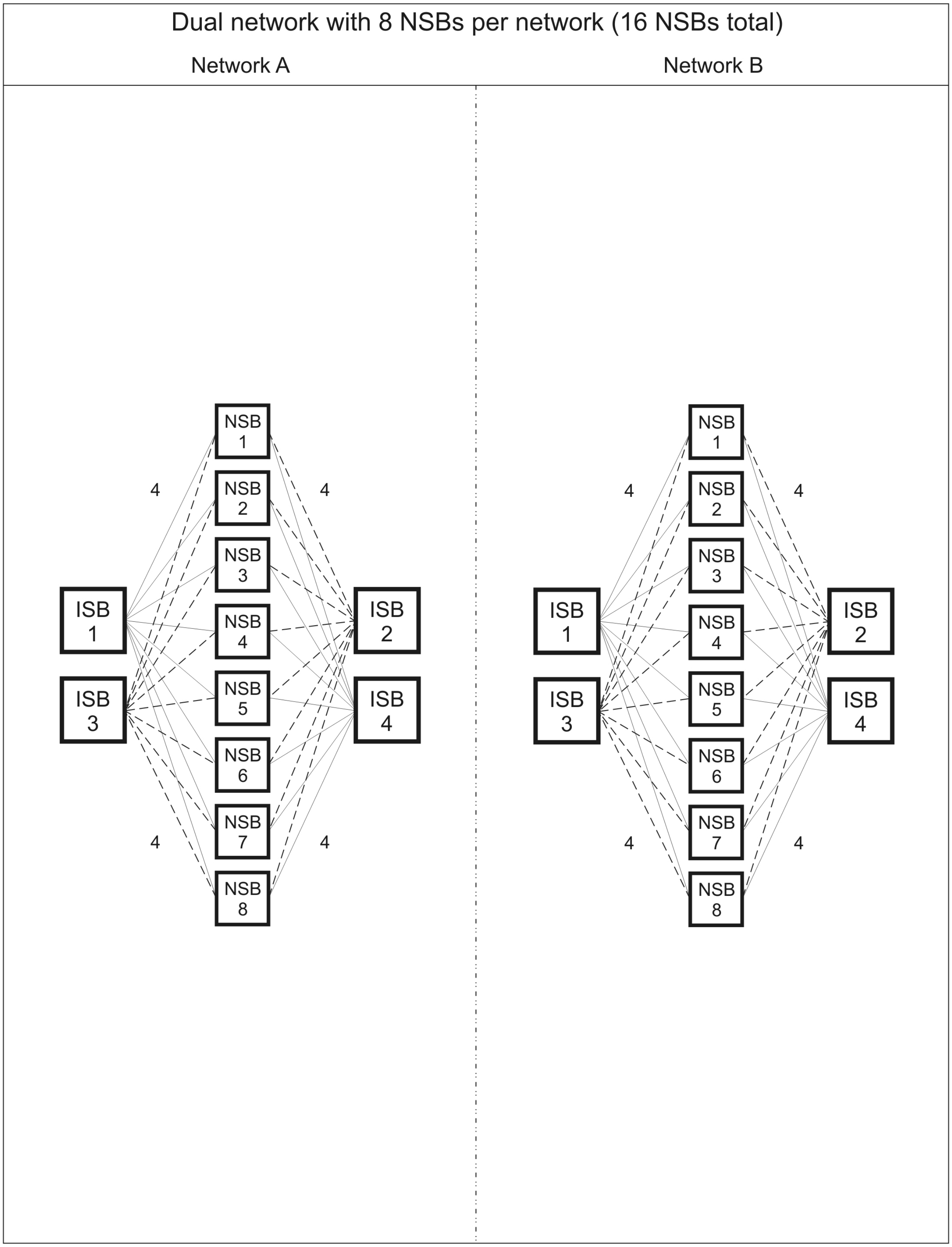


Figure 73. Switch cable paths for dual network system with eight NSBs and four ISBs per network

Switch-to-switch cable connections

Unless required by configuration rules, **all** SPC cards used for switch-to-switch communication on both ISBs and NSBs must be fully cabled. Use the tables in this section to make the proper connections between switches and to record the associated cable serial numbers. The tables in this section identify the switch-to-switch cable attachment locations for:

- “Systems with 2 NSBs per network”
- “Systems with 3 NSBs per network” on page 350
- “Systems with 4 NSBs per network” on page 352
- “Single network system with 5 NSBs” on page 357
- “Single network system with 6 NSBs” on page 363
- “Single network system with 7 NSBs” on page 369
- “Single network system with 8 NSBs” on page 377
- “Dual network system with 16 NSBs” on page 385

Note: Single network configurations with one NSB and dual network configurations with two NSBs do not require switch-to-switch cables.

Systems with 2 NSBs per network

Note: If you are cabling a single network system with four NSBs, refer to “Systems with 4 NSBs per network” on page 352.

Single network systems and dual network systems

The connections described in this section apply to both:
- Single network systems with two NSBs
- Dual network systems with four NSBs

When you configure a dual network system, each network has its own, independent switch fabric. Because of that, when you have a dual network configuration with four NSBs, you must cable each network as if it were a single network system with two NSBs. Specifically, use the same port locations for:
- NSB 3 that you used for NSB 1
- NSB 4 that you used for NSB 2

Note: NSB 1 and 2 are not connected to NSB 3 and 4.

If you are installing a network with two switches per network, you must configure both switches on each network as Node Switch Boards (NSBs). Each of these NSBs will have eight switch slots for switch-to-switch communication and eight switch slots for server-to-switch communication. Therefore, a system with two NSBs per network has:

- A total of 16 switch-to-switch slots per network that must be populated and will require 16 SPC cards per network and 16 switch-to-switch cables per network
- A total of 16 additional slots per network that will support up to 32 server-to-switch links on each network
- The total number of cables and SPC cards required is the sum of the switch-to-switch and server-to-switch requirements

Fiber optic switch cable connections

If you are using the information in this section to connect fiber optic cables, remember that:

- Ordering one fiber optic cable feature code delivers a cable pair
- If the port on the first switch is listed as T1 and the associated port on the second switch is also listed as a T1 port, then the actual fiber optic cable connections are:
  – The first cable of the pair connects Switch 1 T1i to Switch 2 T1o
  – The second cable of the pair connects Switch 1 T1o to Switch 2 T1i
- If the port on the first switch is listed as T1 and the associated port on the second switch is listed as a T2 port, then the actual fiber optic cable connections are:
  – The first cable of the pair connects Switch 1 T1i to Switch 2 T2o
  – The second cable of the pair connects Switch 1 T1o to Switch 2 T2i
- When labeling fiber optic cable pairs:
  – Both cables share the same serial number
  – One end of each cable is labeled as the input end and the other end of that cable is labeled as the output end

Table 80 lists the port locations that must be cabled together for switch-to-switch communication in a system having two NSBs per network.

Note: To maintain cooling airflow, any switch slot that does not have a cabled Switch Port Connection card installed, must be populated with a blank SPC card.

Table 80. Switch-to-switch cable connection locations for networks with two NSBs per network

NSB 1 (see note 1)	NSB 2 (see note 1)	Cable serial number
Slot C1 Port T1	Slot C1 Port T1	
Slot C1 Port T2	Slot C1 Port T2	
Slot C2 Port T1	Slot C2 Port T1	
Slot C2 Port T2	Slot C2 Port T2	
Slot C5 Port T1	Slot C5 Port T1	
Slot C5 Port T2	Slot C5 Port T2	
Slot C6 Port T1	Slot C6 Port T1	
Slot C6 Port T2	Slot C6 Port T2	
Slot C9 Port T1	Slot C9 Port T1	
Slot C9 Port T2	Slot C9 Port T2	
Slot C10 Port T1	Slot C10 Port T1	
Slot C10 Port T2	Slot C10 Port T2	
Slot C13 Port T1	Slot C13 Port T1	
Slot C13 Port T2	Slot C13 Port T2	
Slot C14 Port T1	Slot C14 Port T1	
Slot C14 Port T2	Slot C14 Port T2	

Table 80. Switch-to-switch cable connection locations for networks with two NSBs per network (continued)

NSB 1 (see note 1)	NSB 2 (see note 1)	Cable serial number
Notes: 1. If you are cabling a dual network system: • The port locations noted for NSB 1 also apply to NSB 3 • The port locations noted for NSB 2 also apply to NSB 4 2. Use the blank labels that are pre-attached to both ends of each switch cable to record the serial number on each cable. 3. Fiber optic cables must be labeled in pairs. Both cables of the pair share the same serial number. However, one end of each cable must be labeled for data output and the other end of that cable labeled for data input.		

Systems with 3 NSBs per network

Note: If you are cabling a single network system with six NSBs, refer to "Single network system with 6 NSBs" on page 363.

Single network systems and dual network systems

The connections described in this section apply to both:
- A single network system with three NSBs
- A dual network system with six NSBs

When you configure a dual network system, each network has its own, independent switch fabric. Because of that, when you have a dual network system with six NSBs, you must cable each network as if it were a single network system with three NSBs. Specifically, use the same port locations for:
- NSB 4 that you used for NSB 1
- NSB 5 that you used for NSB 2
- NSB 6 that you used for NSB 3

Note: NSB 1, 2, and 3 are not connected to NSB 4, 5, and 6.

If you are installing a network with three switches per network, you must configure all three switches on each network as Node Switch Boards (NSBs). Each of these NSBs will have eight switch slots for switch-to-switch communication and eight switch slots for server-to-switch communication. Therefore, a system with three NSBs per network has:

- A total of 24 switch-to-switch slots per network that must be populated and will require 24 SPC cards per network and 24 switch-to-switch cables per network
- A total of 24 additional slots per network that will support up to 48 server-to-switch links on each network
- The total number of cables and SPC cards required is the sum of the switch-to-switch and server-to-switch requirements

Fiber optic switch cable connections

If you are using the information in this section to connect fiber optic cables, remember that:

- Ordering one fiber optic cable feature code delivers a cable pair
- If the port on the first switch is listed as T1 and the associated port on the second switch is also listed as a T1 port, then the actual fiber optic cable connections are:
  - The first cable of the pair connects Switch 1 T1i to Switch 2 T1o
  - The second cable of the pair connects Switch 1 T1o to Switch 2 T1i
- If the port on the first switch is listed as T1 and the associated port on the second switch is listed as a T2 port, then the actual fiber optic cable connections are:
  - The first cable of the pair connects Switch 1 T1i to Switch 2 T2o
  - The second cable of the pair connects Switch 1 T1o to Switch 2 T2i
- When labeling fiber optic cable pairs:
  - Both cables share the same serial number
  - One end of each cable is labeled as the input end and the other end of that cable is labeled as the output end

Table 81 on page 351 lists the port locations that must be cabled together for switch-to-switch communication in a system having three NSBs per network.

Note: To maintain cooling airflow, any switch slot that does not have a cabled Switch Port Connection card installed, must be populated with a blank SPC card.

Table 81. Switch-to-switch cable connection locations for networks with three NSBs per network

NSB 1 (see note 1)	NSB 2 (see note 1)	NSB 3 (see note 1)	Cable serial number
Slot C1 Port T1		Slot C2 Port T1	
Slot C1 Port T2		Slot C2 Port T2	
Slot C2 Port T1	Slot C1 Port T1		
Slot C2 Port T2	Slot C1 Port T2		
Slot C5 Port T1		Slot C6 Port T1	
Slot C5 Port T2		Slot C6 Port T2	
Slot C6 Port T1	Slot C5 Port T1		
Slot C6 Port T2	Slot C5 Port T2		
Slot C9 Port T1		Slot C10 Port T1	
Slot C9 Port T2		Slot C10 Port T2	
Slot C10 Port T1	Slot C9 Port T1		
Slot C10 Port T2	Slot C9 Port T2		
Slot C13 Port T1		Slot C14 Port T1	
Slot C13 Port T2		Slot C14 Port T2	
Slot C14 Port T1	Slot C13 Port T1		
Slot C14 Port T2	Slot C13 Port T2		
	Slot C2 Port T1	Slot C1 Port T1	
	Slot C2 Port T2	Slot C1 Port T2	
	Slot C6 Port T1	Slot C5 Port T1	
	Slot C6 Port T2	Slot C5 Port T2	
	Slot C10 Port T1	Slot C9 Port T1	
	Slot C10 Port T2	Slot C9 Port T2	
	Slot C14 Port T1	Slot C13 Port T1	
	Slot C14 Port T2	Slot C13 Port T2	

Notes:

1. If you are cabling a dual network system:
   - The port locations noted for NSB 1 also apply to NSB 4
   - The port locations noted for NSB 2 also apply to NSB 5
   - The port locations noted for NSB 3 also apply to NSB 6
2. Use the blank labels that are pre-attached to both ends of each switch cable to record the serial number on each cable.
3. Fiber optic cables must be labeled in pairs. Both cables of the pair share the same serial number. However, one end of each cable must be labeled for data output and the other end of that cable labeled for data input.

Systems with 4 NSBs per network

Notes:

1. If you are cabling a **dual network system** with four NSBs, refer to “Systems with 2 NSBs per network” on page 347.
2. If you are cabling a **single network system** with eight NSBs, refer to “Single network system with 8 NSBs” on page 377.

Single network systems and dual network systems

The connections described in this section apply to both:

- A single network systems with four NSBs
- A dual network systems with eight NSBs

When you configure a dual network system, each network has its own, independent switch fabric. Because of that, when you have a dual network system with eight NSBs, you must cable each network as if it were a single network system with four NSBs. Specifically, use the same port locations for:

- NSB 5 that you used for NSB 1
- NSB 6 that you used for NSB 2
- NSB 7 that you used for NSB 3
- NSB 8 that you used for NSB 4
- ISB 3 that you used for ISB 1
- ISB 4 that you used for ISB 2

Note: NSB 1, 2, 3, and 4 are not connected to NSB 5, 6, 7, and 8. In addition, ISB 1 and 2 are not connected to ISB 3 and 4.

If you are installing a network with four Node Switch Boards (NSBs) per network, you must also install two Intermediate Switch Boards (ISBs) per network. Because these networks have NSBs and ISBs, all switch-to-switch communication must be routed through the ISBs. Each NSB has eight switch slots for switch-to-switch communication and eight switch slots for server-to-switch communication. Therefore, a system with four NSBs per network has:

- A total of 64 switch-to-switch slots per network that must be populated and will require 64 SPC cards per network and 64 switch-to-switch cables per network
- A total of 32 additional slots per network that will support up to 64 server-to-switch links on each network
- The total number of cables and SPC cards required is the sum of the switch-to-switch and server-to-switch requirements

Fiber optic switch cable connections

If you are using the information in this section to connect fiber optic cables, remember that:

- Ordering one fiber optic cable feature code delivers a cable pair
- If the port on the first switch is listed as T1 and the associated port on the second switch is also listed as a T1 port, then the actual fiber optic cable connections are:
  - The first cable of the pair connects Switch 1 T1i to Switch 2 T1o
  - The second cable of the pair connects Switch 1 T1o to Switch 2 T1i
- If the port on the first switch is listed as T1 and the associated port on the second switch is listed as a T2 port, then the actual fiber optic cable connections are:
  - The first cable of the pair connects Switch 1 T1i to Switch 2 T2o
  - The second cable of the pair connects Switch 1 T1o to Switch 2 T2i
- When labeling fiber optic cable pairs:
  - Both cables share the same serial number
  - One end of each cable is labeled as the input end and the other end of that cable is labeled as the output end

Table 82 lists the port locations that must be cabled together for switch-to-switch communication in a system having four NSBs per network.

Note: To maintain cooling airflow, any switch slot that does not have a cabled Switch Port Connection card installed, must be populated with a blank SPC card.

Table 82. Switch-to-switch cable connection locations for networks with four NSBs per network

NSB 1 (see note 1)	NSB 2 (see note 1)	NSB 3 (see note 1)	NSB 4 (see note 1)	ISB 1 (see note 1)	ISB 2 (see note 1)	Cable serial number
Slot C1 Port T1				Slot C1 Port T1		
Slot C1 Port T2					Slot C1 Port T1	
Slot C2 Port T1				Slot C3 Port T1		
Slot C2 Port T2					Slot C3 Port T1	
	Slot C1 Port T1			Slot C1 Port T2		
	Slot C1 Port T2				Slot C1 Port T2	
	Slot C2 Port T1			Slot C3 Port T2		
	Slot C2 Port T2				Slot C3 Port T2	
		Slot C1 Port T1		Slot C2 Port T1		
		Slot C1 Port T2			Slot C2 Port T1	
		Slot C2 Port T1		Slot C4 Port T1		
		Slot C2 Port T2			Slot C4 Port T1	

Table 82. Switch-to-switch cable connection locations for networks with four NSBs per network (continued)

NSB 1 (see note 1)	NSB 2 (see note 1)	NSB 3 (see note 1)	NSB 4 (see note 1)	ISB 1 (see note 1)	ISB 2 (see note 1)	Cable serial number
			Slot C1 Port T1	Slot C2 Port T2		
			Slot C1 Port T2		Slot C2 Port T2	
			Slot C2 Port T1	Slot C4 Port T2		
			Slot C2 Port T2		Slot C4 Port T2	
Slot C5 Port T1				Slot C5 Port T1		
Slot C5 Port T2					Slot C5 Port T1	
Slot C6 Port T1				Slot C7 Port T1		
Slot C6 Port T2					Slot C7 Port T1	
	Slot C5 Port T1			Slot C5 Port T2		
	Slot C5 Port T2				Slot C5 Port T2	
	Slot C6 Port T1			Slot C7 Port T2		
	Slot C6 Port T2				Slot C7 Port T2	
		Slot C5 Port T1		Slot C6 Port T1		
		Slot C5 Port T2			Slot C6 Port T1	
		Slot C6 Port T1		Slot C8 Port T1		
		Slot C6 Port T2			Slot C8 Port T1	
			Slot C5 Port T1	Slot C6 Port T2		
			Slot C5 Port T2		Slot C6 Port T2	
			Slot C6 Port T1	Slot C8 Port T2		
			Slot C6 Port T2		Slot C8 Port T2	
Slot C9 Port T1				Slot C9 Port T1		
Slot C9 Port T2					Slot C9 Port T1	
Slot C10 Port T1				Slot C11 Port T1		

Table 82. Switch-to-switch cable connection locations for networks with four NSBs per network (continued)

NSB 1 (see note 1)	NSB 2 (see note 1)	NSB 3 (see note 1)	NSB 4 (see note 1)	ISB 1 (see note 1)	ISB 2 (see note 1)	Cable serial number
Slot C10 Port T2					Slot C11 Port T1	
	Slot C9 Port T1			Slot C9 Port T2		
	Slot C9 Port T2				Slot C9 Port T2	
	Slot C10 Port T1			Slot C11 Port T2		
	Slot C10 Port T2				Slot C11 Port T2	
		Slot C9 Port T1		Slot C10 Port T1		
		Slot C9 Port T2			Slot C10 Port T1	
		Slot C10 Port T1		Slot C12 Port T1		
		Slot C10 Port T2			Slot C12 Port T1	
			Slot C9 Port T1	Slot C10 Port T2		
			Slot C9 Port T2		Slot C10 Port T2	
			Slot C10 Port T1	Slot C12 Port T2		
			Slot C10 Port T2		Slot C12 Port T2	
Slot C13 Port T1				Slot C13 Port T1		
Slot C13 Port T2					Slot C13 Port T1	
Slot C14 Port T1				Slot C15 Port T1		
Slot C14 Port T2					Slot C15 Port T1	
	Slot C13 Port T1			Slot C13 Port T2		
	Slot C13 Port T2				Slot C13 Port T2	
	Slot C14 Port T1			Slot C15 Port T2		
	Slot C14 Port T2				Slot C15 Port T2	
		Slot C13 Port T1		Slot C14 Port T1		
		Slot C13 Port T2			Slot C14 Port T1	

Table 82. Switch-to-switch cable connection locations for networks with four NSBs per network (continued)

NSB 1 (see note 1)	NSB 2 (see note 1)	NSB 3 (see note 1)	NSB 4 (see note 1)	ISB 1 (see note 1)	ISB 2 (see note 1)	Cable serial number
		Slot C14 Port T1		Slot C16 Port T1		
		Slot C14 Port T2			Slot C16 Port T1	
			Slot C13 Port T1	Slot C14 Port T2		
			Slot C13 Port T2		Slot C14 Port T2	
			Slot C14 Port T1	Slot C16 Port T2		
			Slot C14 Port T2		Slot C16 Port T2	

Notes:

1. If you are cabling a dual network system:
   - The port locations noted for NSB 1 also apply to NSB 5
   - The port locations noted for NSB 2 also apply to NSB 6
   - The port locations noted for NSB 3 also apply to NSB 7
   - The port locations noted for NSB 4 also apply to NSB 8
   - The port locations noted for ISB 1 also apply to ISB 3
   - The port locations noted for ISB 2 also apply to ISB 4
2. Use the blank labels that are pre-attached to both ends of each switch cable to record the serial number on each cable.
3. Fiber optic cables must be labeled in pairs. Both cables of the pair share the same serial number. However, one end of each cable must be labeled for data output and the other end of that cable labeled for data input.

Single network system with 5 NSBs

A single network system with five Node Switch Boards (NSBs) also requires four switches configured as Intermediate Switch Boards (ISBs). Each NSB has eight switch slots for server-to-switch communication and eight switch slots for switch-to-switch communication. A five NSB system:

- Has a total of 40 server-to-switch slots supporting up to 80 server-to-switch links
- Requires 88 SPC cards (8 per NSB plus 12 per ISB) and 80 switch-to-switch cables for switch-to-switch communication
- The total number of cables and SPC cards required is the sum of the switch-to-switch and server-to-switch requirements

Fiber optic switch cable connections

If you are using the information in this section to connect fiber optic cables, remember that:

- Ordering one fiber optic cable feature code delivers a cable pair
- If the port on the first switch is listed as T1 and the associated port on the second switch is also listed as a T1 port, then the actual fiber optic cable connections are:
  - The first cable of the pair connects Switch 1 T1i to Switch 2 T1o
  - The second cable of the pair connects Switch 1 T1o to Switch 2 T1i
- If the port on the first switch is listed as T1 and the associated port on the second switch is listed as a T2 port, then the actual fiber optic cable connections are:
  - The first cable of the pair connects Switch 1 T1i to Switch 2 T2o
  - The second cable of the pair connects Switch 1 T1o to Switch 2 T2i
- When labeling fiber optic cable pairs:
  - Both cables share the same serial number
  - One end of each cable is labeled as the input end and the other end of that cable is labeled as the output end

Table 83, Table 84 on page 358, Table 85 on page 360, and Table 86 on page 361 list the port locations that must be cabled together for switch-to-switch communication in a single network system with five NSBs.

Note: To maintain cooling airflow, any switch slot that does not have a cabled Switch Port Connection card installed, must be populated with a blank SPC card.

Table 83. Switch-to-switch cable connection locations for ISB 1 in a single network system with five NSBs

NSB 1	NSB 2	NSB 3	NSB 4	NSB 5	ISB 1	Cable serial number
Slot C1 Port T1					Slot C1 Port T1	
	Slot C1 Port T1				Slot C1 Port T2	
		Slot C1 Port T1			Slot C2 Port T1	
			Slot C1 Port T1		Slot C2 Port T2	
				Slot C1 Port T1	Slot C3 Port T1	
Slot C5 Port T1					Slot C5 Port T1	
	Slot C5 Port T1				Slot C5 Port T2	

Table 83. Switch-to-switch cable connection locations for ISB 1 in a single network system with five NSBs (continued)

NSB 1	NSB 2	NSB 3	NSB 4	NSB 5	ISB 1	Cable serial number
		Slot C5 Port T1			Slot C6 Port T1	
			Slot C5 Port T1		Slot C6 Port T2	
				Slot C5 Port T1	Slot C7 Port T1	
Slot C9 Port T1					Slot C9 Port T1	
	Slot C9 Port T1				Slot C9 Port T2	
		Slot C9 Port T1			Slot C10 Port T1	
			Slot C9 Port T1		Slot C10 Port T2	
				Slot C9 Port T1	Slot C11 Port T1	
Slot C13 Port T1					Slot C13 Port T1	
	Slot C13 Port T1				Slot C13 Port T2	
		Slot C13 Port T1			Slot C14 Port T1	
			Slot C13 Port T1		Slot C14 Port T2	
				Slot C13 Port T1	Slot C15 Port T1	

Notes:

1. In this configuration, the following ports on **ISB 1** are not cabled and therefore require port covers for EMC compliance:
   - Slot C7 Port T2
   - Slot C11 Port T2
   - Slot C15 Port T2
2. Use the blank labels that are pre-attached to both ends of each switch cable to record the serial number on each cable. Fiber optic cables must be labeled in pairs. Both cables of the pair share the same serial number. However, one end of each cable must be labeled for data output and the other end of the cable labeled for data input.

Table 84. Switch-to-switch cable connection locations for ISB 2 in a single network system with five NSBs

NSB 1	NSB 2	NSB 3	NSB 4	NSB 5	ISB 2	Cable serial number
Slot C1 Port T2					Slot C1 Port T1	
	Slot C1 Port T2				Slot C1 Port T2	
		Slot C1 Port T2			Slot C2 Port T1	

Table 84. Switch-to-switch cable connection locations for ISB 2 in a single network system with five NSBs (continued)

NSB 1	NSB 2	NSB 3	NSB 4	NSB 5	ISB 2	Cable serial number
			Slot C1 Port T2		Slot C2 Port T2	
				Slot C1 Port T2	Slot C3 Port T1	
Slot C5 Port T2					Slot C5 Port T1	
	Slot C5 Port T2				Slot C5 Port T2	
		Slot C5 Port T2			Slot C6 Port T1	
			Slot C5 Port T2		Slot C6 Port T2	
				Slot C5 Port T2	Slot C7 Port T1	
Slot C9 Port T2					Slot C9 Port T1	
	Slot C9 Port T2				Slot C9 Port T2	
		Slot C9 Port T2			Slot C10 Port T1	
			Slot C9 Port T2		Slot C10 Port T2	
				Slot C9 Port T2	Slot C11 Port T1	
Slot C13 Port T2					Slot C13 Port T1	
	Slot C13 Port T2				Slot C13 Port T2	
		Slot C13 Port T2			Slot C14 Port T1	
			Slot C13 Port T2		Slot C14 Port T2	
				Slot C13 Port T2	Slot C15 Port T1	

Notes:

1. In this configuration, the following ports on **ISB 2** are not cabled and therefore require port covers for EMC compliance:
   - Slot C7 Port T2
   - Slot C11 Port T2
   - Slot C15 Port T2
2. Use the blank labels that are pre-attached to both ends of each switch cable to record the serial number on each cable. Fiber optic cables must be labeled in pairs. Both cables of the pair share the same serial number. However, one end of each cable must be labeled for data output and the other end of the cable labeled for data input.

Table 85. Switch-to-switch cable connection locations for ISB 3 in a single network system with five NSBs

NSB 1	NSB 2	NSB 3	NSB 4	NSB 5	ISB 3	Cable serial number
Slot C2 Port T1					Slot C1 Port T1	
	Slot C2 Port T1				Slot C1 Port T2	
		Slot C2 Port T1			Slot C2 Port T1	
			Slot C2 Port T1		Slot C2 Port T2	
				Slot C2 Port T1	Slot C3 Port T1	
Slot C6 Port T1					Slot C5 Port T1	
	Slot C6 Port T1				Slot C5 Port T2	
		Slot C6 Port T1			Slot C6 Port T1	
			Slot C6 Port T1		Slot C6 Port T2	
				Slot C6 Port T1	Slot C7 Port T1	
Slot C10 Port T1					Slot C9 Port T1	
	Slot C10 Port T1				Slot C9 Port T2	
		Slot C10 Port T1			Slot C10 Port T1	
			Slot C10 Port T1		Slot C10 Port T2	
				Slot C10 Port T1	Slot C11 Port T1	
Slot C14 Port T1					Slot C13 Port T1	
	Slot C14 Port T1				Slot C13 Port T2	
		Slot C14 Port T1			Slot C14 Port T1	
			Slot C14 Port T1		Slot C14 Port T2	
				Slot C14 Port T1	Slot C15 Port T1	

Table 85. Switch-to-switch cable connection locations for ISB 3 in a single network system with five NSBs (continued)

NSB 1	NSB 2	NSB 3	NSB 4	NSB 5	ISB 3	Cable serial number

Notes:

1. In this configuration, the following ports on **ISB 3** are not cabled and therefore require port covers for EMC compliance:
   - Slot C7 Port T2
   - Slot C11 Port T2
   - Slot C15 Port T2
2. Use the blank labels that are pre-attached to both ends of each switch cable to record the serial number on each cable. Fiber optic cables must be labeled in pairs. Both cables of the pair share the same serial number. However, one end of each cable must be labeled for data output and the other end of the cable labeled for data input.

Table 86. Switch-to-switch cable connection locations for ISB 4 in a single network system with five NSBs

NSB 1	NSB 2	NSB 3	NSB 4	NSB 5	ISB 4	Cable serial number
Slot C2 Port T2					Slot C1 Port T1	
	Slot C2 Port T2				Slot C1 Port T2	
		Slot C2 Port T2			Slot C2 Port T1	
			Slot C2 Port T2		Slot C2 Port T2	
				Slot C2 Port T2	Slot C3 Port T1	
Slot C6 Port T2					Slot C5 Port T1	
	Slot C6 Port T2				Slot C5 Port T2	
		Slot C6 Port T2			Slot C6 Port T1	
			Slot C6 Port T2		Slot C6 Port T2	
				Slot C6 Port T2	Slot C7 Port T1	
Slot C10 Port T2					Slot C9 Port T1	
	Slot C10 Port T2				Slot C9 Port T2	
		Slot C10 Port T2			Slot C10 Port T1	
			Slot C10 Port T2		Slot C10 Port T2	
				Slot C10 Port T2	Slot C11 Port T1	
Slot C14 Port T2					Slot C13 Port T1	

Table 86. Switch-to-switch cable connection locations for ISB 4 in a single network system with five NSBs (continued)

NSB 1	NSB 2	NSB 3	NSB 4	NSB 5	ISB 4	Cable serial number
	Slot C14 Port T2				Slot C13 Port T2	
		Slot C14 Port T2			Slot C14 Port T1	
			Slot C14 Port T2		Slot C14 Port T2	
				Slot C14 Port T2	Slot C15 Port T1	

Notes:

1. In this configuration, the following ports on **ISB 4** are not cabled and therefore require port covers for EMC compliance:
   - Slot C7 Port T2
   - Slot C11 Port T2
   - Slot C15 Port T2
2. Use the blank labels that are pre-attached to both ends of each switch cable to record the serial number on each cable. Fiber optic cables must be labeled in pairs. Both cables of the pair share the same serial number. However, one end of each cable must be labeled for data output and the other end of the cable labeled for data input.

Single network system with 6 NSBs

Note: If you are cabling a **dual network system** with six NSBs, refer to "Systems with 3 NSBs per network" on page 350.

A single network system with six Node Switch Boards (NSBs) also requires four switches configured as Intermediate Switch Boards (ISBs). Each NSB has eight switch slots for server-to-switch communication and eight switch slots for switch-to-switch communication. A six NSB system:

- Has a total of 48 server-to-switch slots supporting up to 96 server-to-switch links
- Requires 96 SPC cards (8 per NSB plus 12 per ISB) and 96 switch-to-switch cables for switch-to-switch communication
- The total number of cables and SPC cards required is the sum of the switch-to-switch and server-to-switch requirements

Fiber optic switch cable connections

If you are using the information in this section to connect fiber optic cables, remember that:

- Ordering one fiber optic cable feature code delivers a cable pair
- If the port on the first switch is listed as T1 and the associated port on the second switch is also listed as a T1 port, then the actual fiber optic cable connections are:
  - The first cable of the pair connects Switch 1 T1i to Switch 2 T1o
  - The second cable of the pair connects Switch 1 T1o to Switch 2 T1i
- If the port on the first switch is listed as T1 and the associated port on the second switch is listed as a T2 port, then the actual fiber optic cable connections are:
  - The first cable of the pair connects Switch 1 T1i to Switch 2 T2o
  - The second cable of the pair connects Switch 1 T1o to Switch 2 T2i
- When labeling fiber optic cable pairs:
  - Both cables share the same serial number
  - One end of each cable is labeled as the input end and the other end of that cable is labeled as the output end

Table 87, Table 88 on page 364, Table 89 on page 366, and Table 90 on page 367 list the port locations that must be cabled together for switch-to-switch communication in a single network system with six NSBs.

Note: To maintain cooling airflow, any switch slot that does not have a cabled Switch Port Connection card installed, must be populated with a blank SPC card.

Table 87. Switch-to-switch cable connection locations for ISB 1 in a single network system with six NSBs

NSB 1	NSB 2	NSB 3	NSB 4	NSB 5	NSB 6	ISB 1	Cable serial number
Slot C1 Port T1						Slot C1 Port T1	
	Slot C1 Port T1					Slot C1 Port T2	
		Slot C1 Port T1				Slot C2 Port T1	
			Slot C1 Port T1			Slot C2 Port T2	
				Slot C1 Port T1		Slot C3 Port T1	
					Slot C1 Port T1	Slot C3 Port T2	

Table 87. Switch-to-switch cable connection locations for ISB 1 in a single network system with six NSBs (continued)

NSB 1	NSB 2	NSB 3	NSB 4	NSB 5	NSB 6	ISB 1	Cable serial number
Slot C5 Port T1						Slot C5 Port T1	
	Slot C5 Port T1					Slot C5 Port T2	
		Slot C5 Port T1				Slot C6 Port T1	
			Slot C5 Port T1			Slot C6 Port T2	
				Slot C5 Port T1		Slot C7 Port T1	
					Slot C5 Port T1	Slot C7 Port T2	
Slot C9 Port T1						Slot C9 Port T1	
	Slot C9 Port T1					Slot C9 Port T2	
		Slot C9 Port T1				Slot C10 Port T1	
			Slot C9 Port T1			Slot C10 Port T2	
				Slot C9 Port T1		Slot C11 Port T1	
					Slot C9 Port T1	Slot C11 Port T2	
Slot C13 Port T1						Slot C13 Port T1	
	Slot C13 Port T1					Slot C13 Port T2	
		Slot C13 Port T1				Slot C14 Port T1	
			Slot C13 Port T1			Slot C14 Port T2	
				Slot C13 Port T1		Slot C15 Port T1	
					Slot C13 Port T1	Slot C15 Port T1	
Note: Use the blank labels that are pre-attached to both ends of each switch cable to record the serial number on each cable. Fiber optic cables must be labeled in pairs. Both cables of the pair share the same serial number. However, one end of each cable must be labeled for data output and the other end of the cable labeled for data input.							

Table 88. Switch-to-switch cable connection locations for ISB 2 in a single network system with six NSBs

NSB 1	NSB 2	NSB 3	NSB 4	NSB 5	NSB 6	ISB 2	Cable serial number
Slot C1 Port T2						Slot C1 Port T1	

Table 88. Switch-to-switch cable connection locations for ISB 2 in a single network system with six NSBs (continued)

NSB 1	NSB 2	NSB 3	NSB 4	NSB 5	NSB 6	ISB 2	Cable serial number
	Slot C1 Port T2					Slot C1 Port T2	
		Slot C1 Port T2				Slot C2 Port T1	
			Slot C1 Port T2			Slot C2 Port T2	
				Slot C1 Port T2		Slot C3 Port T1	
					Slot C1 Port T2	Slot C3 Port T2	
Slot C5 Port T2						Slot C5 Port T1	
	Slot C5 Port T2					Slot C5 Port T2	
		Slot C5 Port T2				Slot C6 Port T1	
			Slot C5 Port T2			Slot C6 Port T2	
				Slot C5 Port T2		Slot C7 Port T1	
					Slot C5 Port T2	Slot C7 Port T2	
Slot C9 Port T2						Slot C9 Port T1	
	Slot C9 Port T2					Slot C9 Port T2	
		Slot C9 Port T2				Slot C10 Port T1	
			Slot C9 Port T2			Slot C10 Port T2	
				Slot C9 Port T2		Slot C11 Port T1	
					Slot C9 Port T2	Slot C11 Port T2	
Slot C13 Port T2						Slot C13 Port T1	
	Slot C13 Port T2					Slot C13 Port T2	
		Slot C13 Port T2				Slot C14 Port T1	
			Slot C13 Port T2			Slot C14 Port T2	
				Slot C13 Port T2		Slot C15 Port T1	
					Slot C13 Port T2	Slot C15 Port T1	

Table 88. Switch-to-switch cable connection locations for ISB 2 in a single network system with six NSBs (continued)

NSB 1	NSB 2	NSB 3	NSB 4	NSB 5	NSB 6	ISB 2	Cable serial number
Note: Use the blank labels that are pre-attached to both ends of each switch cable to record the serial number on each cable. Fiber optic cables must be labeled in pairs. Both cables of the pair share the same serial number. However, one end of each cable must be labeled for data output and the other end of the cable labeled for data input.							

Table 89. Switch-to-switch cable connection locations for ISB 3 in a single network system with six NSBs

NSB 1	NSB 2	NSB 3	NSB 4	NSB 5	NSB 6	ISB 3	Cable serial number
Slot C2 Port T1						Slot C1 Port T1	
	Slot C2 Port T1					Slot C1 Port T2	
		Slot C2 Port T1				Slot C2 Port T1	
			Slot C2 Port T1			Slot C2 Port T2	
				Slot C2 Port T1		Slot C3 Port T1	
					Slot C2 Port T1	Slot C3 Port T2	
Slot C6 Port T1						Slot C5 Port T1	
	Slot C6 Port T1					Slot C5 Port T2	
		Slot C6 Port T1				Slot C6 Port T1	
			Slot C6 Port T1			Slot C6 Port T2	
				Slot C6 Port T1		Slot C7 Port T1	
					Slot C6 Port T1	Slot C7 Port T2	
Slot C10 Port T1						Slot C9 Port T1	
	Slot C10 Port T1					Slot C9 Port T2	
		Slot C10 Port T1				Slot C10 Port T1	
			Slot C10 Port T1			Slot C10 Port T2	
				Slot C10 Port T1		Slot C11 Port T1	
					Slot C10 Port T1	Slot C11 Port T2	
Slot C14 Port T1						Slot C13 Port T1	

Table 89. Switch-to-switch cable connection locations for ISB 3 in a single network system with six NSBs (continued)

NSB 1	NSB 2	NSB 3	NSB 4	NSB 5	NSB 6	ISB 3	Cable serial number
	Slot C14 Port T1					Slot C13 Port T2	
		Slot C14 Port T1				Slot C14 Port T1	
			Slot C14 Port T1			Slot C14 Port T2	
				Slot C14 Port T1		Slot C15 Port T1	
					Slot C14 Port T1	Slot C15 Port T1	
Note: Use the blank labels that are pre-attached to both ends of each switch cable to record the serial number on each cable. Fiber optic cables must be labeled in pairs. Both cables of the pair share the same serial number. However, one end of each cable must be labeled for data output and the other end of the cable labeled for data input.							

Table 90. Switch-to-switch cable connection locations for ISB 4 in a single network system with six NSBs

NSB 1	NSB 2	NSB 3	NSB 4	NSB 5	NSB 6	ISB 4	Cable serial number
Slot C2 Port T2						Slot C1 Port T1	
	Slot C2 Port T2					Slot C1 Port T2	
		Slot C2 Port T2				Slot C2 Port T1	
			Slot C2 Port T2			Slot C2 Port T2	
				Slot C2 Port T2		Slot C3 Port T1	
					Slot C2 Port T2	Slot C3 Port T2	
Slot C6 Port T2						Slot C5 Port T1	
	Slot C6 Port T2					Slot C5 Port T2	
		Slot C6 Port T2				Slot C6 Port T1	
			Slot C6 Port T2			Slot C6 Port T2	
				Slot C6 Port T2		Slot C7 Port T1	
					Slot C6 Port T2	Slot C7 Port T2	
Slot C10 Port T2						Slot C9 Port T1	
	Slot C10 Port T2					Slot C9 Port T2	

Table 90. Switch-to-switch cable connection locations for ISB 4 in a single network system with six NSBs (continued)

NSB 1	NSB 2	NSB 3	NSB 4	NSB 5	NSB 6	ISB 4	Cable serial number
		Slot C10 Port T2				Slot C10 Port T1	
			Slot C10 Port T2			Slot C10 Port T2	
				Slot C10 Port T2		Slot C11 Port T1	
					Slot C10 Port T2	Slot C11 Port T2	
Slot C14 Port T2						Slot C13 Port T1	
	Slot C14 Port T2					Slot C13 Port T2	
		Slot C14 Port T2				Slot C14 Port T1	
			Slot C14 Port T2			Slot C14 Port T2	
				Slot C14 Port T2		Slot C15 Port T1	
					Slot C14 Port T2	Slot C15 Port T1	
Note: Use the blank labels that are pre-attached to both ends of each switch cable to record the serial number on each cable. Fiber optic cables must be labeled in pairs. Both cables of the pair share the same serial number. However, one end of each cable must be labeled for data output and the other end of the cable labeled for data input.							

Single network system with 7 NSBs

A single network system with seven Node Switch Boards (NSBs) also requires four switches configured as Intermediate Switch Boards (ISBs). Each NSB has eight switch slots for server-to-switch communication and eight switch slots for switch-to-switch communication. A seven NSB system:

- Has a total of 56 server-to-switch slots supporting up to 112 server-to-switch links
- Requires 120 SPC cards (8 per NSB plus 16 per ISB) and 112 switch-to-switch cables for switch-to-switch communication
- The total number of cables and SPC cards required is the sum of the switch-to-switch and server-to-switch requirements

Fiber optic switch cable connections

If you are using the information in this section to connect fiber optic cables, remember that:

- Ordering one fiber optic cable feature code delivers a cable pair
- If the port on the first switch is listed as T1 and the associated port on the second switch is also listed as a T1 port, then the actual fiber optic cable connections are:
  - The first cable of the pair connects Switch 1 T1i to Switch 2 T1o
  - The second cable of the pair connects Switch 1 T1o to Switch 2 T1i
- If the port on the first switch is listed as T1 and the associated port on the second switch is listed as a T2 port, then the actual fiber optic cable connections are:
  - The first cable of the pair connects Switch 1 T1i to Switch 2 T2o
  - The second cable of the pair connects Switch 1 T1o to Switch 2 T2i
- When labeling fiber optic cable pairs:
  - Both cables share the same serial number
  - One end of each cable is labeled as the input end and the other end of that cable is labeled as the output end

Table 91, Table 92 on page 371, Table 93 on page 373, and Table 94 on page 374 list the port locations that must be cabled together for switch-to-switch communication in a single network system with seven NSBs.

Note: To maintain cooling airflow, any switch slot that does not have a cabled Switch Port Connection card installed, must be populated with a blank SPC card.

Table 91. Switch-to-switch cable connection locations for ISB 1 in a single network system with seven NSBs

NSB 1	NSB 2	NSB 3	NSB 4	NSB 5	NSB 6	NSB 7	ISB 1	Cable serial number
Slot C1 Port T1							Slot C1 Port T1	
	Slot C1 Port T1						Slot C1 Port T2	
		Slot C1 Port T1					Slot C2 Port T1	
			Slot C1 Port T1				Slot C2 Port T2	
				Slot C1 Port T1			Slot C3 Port T1	
					Slot C1 Port T1		Slot C3 Port T2	

Table 91. Switch-to-switch cable connection locations for ISB 1 in a single network system with seven NSBs (continued)

NSB 1	NSB 2	NSB 3	NSB 4	NSB 5	NSB 6	NSB 7	ISB 1	Cable serial number
						Slot C1 Port T1	Slot C4 Port T1	
Slot C5 Port T1							Slot C5 Port T1	
	Slot C5 Port T1						Slot C5 Port T2	
		Slot C5 Port T1					Slot C6 Port T1	
			Slot C5 Port T1				Slot C6 Port T2	
				Slot C5 Port T1			Slot C7 Port T1	
					Slot C5 Port T1		Slot C7 Port T2	
						Slot C5 Port T1	Slot C8 Port T1	
Slot C9 Port T1							Slot C9 Port T1	
	Slot C9 Port T1						Slot C9 Port T2	
		Slot C9 Port T1					Slot C10 Port T1	
			Slot C9 Port T1				Slot C10 Port T2	
				Slot C9 Port T1			Slot C11 Port T1	
					Slot C9 Port T1		Slot C11 Port T2	
						Slot C9 Port T1	Slot C12 Port T1	
Slot C13 Port T1							Slot C13 Port T1	
	Slot C13 Port T1						Slot C13 Port T2	
		Slot C13 Port T1					Slot C14 Port T1	
			Slot C13 Port T1				Slot C14 Port T2	
				Slot C13 Port T1			Slot C15 Port T1	
					Slot C13 Port T1		Slot C15 Port T2	
						Slot C13 Port T1	Slot C16 Port T1	

Table 91. Switch-to-switch cable connection locations for ISB 1 in a single network system with seven NSBs (continued)

NSB 1	NSB 2	NSB 3	NSB 4	NSB 5	NSB 6	NSB 7	ISB 1	Cable serial number

Notes:

1. In this configuration, the following ports on **ISB 1** are not cabled and therefore require port covers for EMC compliance:
   - Slot C4 Port T2
   - Slot C8 Port T2
   - Slot C12 Port T2
   - Slot C16 Port T2
2. Use the blank labels that are pre-attached to both ends of each switch cable to record the serial number on each cable. Fiber optic cables must be labeled in pairs. Both cables of the pair share the same serial number. However, one end of each cable must be labeled for data output and the other end of the cable labeled for data input.

Table 92. Switch-to-switch cable connection locations for ISB 2 in a single network system with seven NSBs

NSB 1	NSB 2	NSB 3	NSB 4	NSB 5	NSB 6	NSB 7	ISB 2	Cable serial number
Slot C1 Port T2							Slot C1 Port T1	
	Slot C1 Port T2						Slot C1 Port T2	
		Slot C1 Port T2					Slot C2 Port T1	
			Slot C1 Port T2				Slot C2 Port T2	
				Slot C1 Port T2			Slot C3 Port T1	
					Slot C1 Port T2		Slot C3 Port T2	
						Slot C1 Port T2	Slot C4 Port T1	
Slot C5 Port T2							Slot C5 Port T1	
	Slot C5 Port T2						Slot C5 Port T2	
		Slot C5 Port T2					Slot C6 Port T1	
			Slot C5 Port T2				Slot C6 Port T2	
				Slot C5 Port T2			Slot C7 Port T1	
					Slot C5 Port T2		Slot C7 Port T2	
						Slot C5 Port T2	Slot C8 Port T1	

Table 92. Switch-to-switch cable connection locations for ISB 2 in a single network system with seven NSBs (continued)

NSB 1	NSB 2	NSB 3	NSB 4	NSB 5	NSB 6	NSB 7	ISB 2	Cable serial number
Slot C9 Port T2							Slot C9 Port T1	
	Slot C9 Port T2						Slot C9 Port T2	
		Slot C9 Port T2					Slot C10 Port T1	
			Slot C9 Port T2				Slot C10 Port T2	
				Slot C9 Port T2			Slot C11 Port T1	
					Slot C9 Port T2		Slot C11 Port T2	
						Slot C9 Port T2	Slot C12 Port T1	
Slot C13 Port T2							Slot C13 Port T1	
	Slot C13 Port T2						Slot C13 Port T2	
		Slot C13 Port T2					Slot C14 Port T1	
			Slot C13 Port T2				Slot C14 Port T2	
				Slot C13 Port T2			Slot C15 Port T1	
					Slot C13 Port T2		Slot C15 Port T2	
						Slot C13 Port T2	Slot C16 Port T1	

Notes:

1. In this configuration, the following ports on **ISB 2** are not cabled and therefore require port covers for EMC compliance:
   - Slot C4 Port T2
   - Slot C8 Port T2
   - Slot C12 Port T2
   - Slot C16 Port T2
2. Use the blank labels that are pre-attached to both ends of each switch cable to record the serial number on each cable. Fiber optic cables must be labeled in pairs. Both cables of the pair share the same serial number. However, one end of each cable must be labeled for data output and the other end of the cable labeled for data input.

Table 93. Switch-to-switch cable connection locations for ISB 3 in a single network system with seven NSBs

NSB 1	NSB 2	NSB 3	NSB 4	NSB 5	NSB 6	NSB 7	ISB 3	Cable serial number
Slot C2 Port T1							Slot C1 Port T1	
	Slot C2 Port T1						Slot C1 Port T2	
		Slot C2 Port T1					Slot C2 Port T1	
			Slot C2 Port T1				Slot C2 Port T2	
				Slot C2 Port T1			Slot C3 Port T1	
					Slot C2 Port T1		Slot C3 Port T2	
						Slot C2 Port T1	Slot C4 Port T1	
Slot C6 Port T1							Slot C5 Port T1	
	Slot C6 Port T1						Slot C5 Port T2	
		Slot C6 Port T1					Slot C6 Port T1	
			Slot C6 Port T1				Slot C6 Port T2	
				Slot C6 Port T1			Slot C7 Port T1	
					Slot C6 Port T1		Slot C7 Port T2	
						Slot C6 Port T1	Slot C8 Port T1	
Slot C10 Port T1							Slot C9 Port T1	
	Slot C10 Port T1						Slot C9 Port T2	
		Slot C10 Port T1					Slot C10 Port T1	
			Slot C10 Port T1				Slot C10 Port T2	
				Slot C10 Port T1			Slot C11 Port T1	
					Slot C10 Port T1		Slot C11 Port T2	
						Slot C10 Port T1	Slot C12 Port T1	
Slot C14 Port T1							Slot C13 Port T1	
	Slot C14 Port T1						Slot C13 Port T2	

Table 93. Switch-to-switch cable connection locations for ISB 3 in a single network system with seven NSBs (continued)

NSB 1	NSB 2	NSB 3	NSB 4	NSB 5	NSB 6	NSB 7	ISB 3	Cable serial number
		Slot C14 Port T1					Slot C14 Port T1	
			Slot C14 Port T1				Slot C14 Port T2	
				Slot C14 Port T1			Slot C15 Port T1	
					Slot C14 Port T1		Slot C15 Port T2	
						Slot C14 Port T1	Slot C16 Port T1	

Notes:

1. In this configuration, the following ports on **ISB 3** are not cabled and therefore require port covers for EMC compliance:
   - Slot C4 Port T2
   - Slot C8 Port T2
   - Slot C12 Port T2
   - Slot C16 Port T2
2. Use the blank labels that are pre-attached to both ends of each switch cable to record the serial number on each cable. Fiber optic cables must be labeled in pairs. Both cables of the pair share the same serial number. However, one end of each cable must be labeled for data output and the other end of the cable labeled for data input.

Table 94. Switch-to-switch cable connection locations for ISB 4 in a single network system with seven NSBs

NSB 1	NSB 2	NSB 3	NSB 4	NSB 5	NSB 6	NSB 7	ISB 4	Cable serial number
Slot C2 Port T2							Slot C1 Port T1	
	Slot C2 Port T2						Slot C1 Port T2	
		Slot C2 Port T2					Slot C2 Port T1	
			Slot C2 Port T2				Slot C2 Port T2	
				Slot C2 Port T2			Slot C3 Port T1	
					Slot C2 Port T2		Slot C3 Port T2	
						Slot C2 Port T2	Slot C4 Port T1	
Slot C6 Port T2							Slot C5 Port T1	
	Slot C6 Port T2						Slot C5 Port T2	

Table 94. Switch-to-switch cable connection locations for ISB 4 in a single network system with seven NSBs (continued)

NSB 1	NSB 2	NSB 3	NSB 4	NSB 5	NSB 6	NSB 7	ISB 4	Cable serial number
		Slot C6 Port T2					Slot C6 Port T1	
			Slot C6 Port T2				Slot C6 Port T2	
				Slot C6 Port T2			Slot C7 Port T1	
					Slot C6 Port T2		Slot C7 Port T2	
						Slot C6 Port T2	Slot C8 Port T1	
Slot C10 Port T2							Slot C9 Port T1	
	Slot C10 Port T2						Slot C9 Port T2	
		Slot C10 Port T2					Slot C10 Port T1	
			Slot C10 Port T2				Slot C10 Port T2	
				Slot C10 Port T2			Slot C11 Port T1	
					Slot C10 Port T2		Slot C11 Port T2	
						Slot C10 Port T2	Slot C12 Port T1	
Slot C14 Port T2							Slot C13 Port T1	
	Slot C14 Port T2						Slot C13 Port T2	
		Slot C14 Port T2					Slot C14 Port T1	
			Slot C14 Port T2				Slot C14 Port T2	
				Slot C14 Port T2			Slot C15 Port T1	
					Slot C14 Port T2		Slot C15 Port T2	
						Slot C14 Port T2	Slot C16 Port T1	

Table 94. Switch-to-switch cable connection locations for ISB 4 in a single network system with seven NSBs (continued)

NSB 1	NSB 2	NSB 3	NSB 4	NSB 5	NSB 6	NSB 7	ISB 4	Cable serial number

Notes:

1. In this configuration, the following ports on **ISB 4** are not cabled and therefore require port covers for EMC compliance:
   - Slot C4 Port T2
   - Slot C8 Port T2
   - Slot C12 Port T2
   - Slot C16 Port T2
2. Use the blank labels that are pre-attached to both ends of each switch cable to record the serial number on each cable. Fiber optic cables must be labeled in pairs. Both cables of the pair share the same serial number. However, one end of each cable must be labeled for data output and the other end of the cable labeled for data input.

Single network system with 8 NSBs

Note: If you are cabling a **dual network system** with eight NSBs, refer to "Systems with 4 NSBs per network" on page 352.

A single network system with eight Node Switch Boards (NSBs) also requires four switches configured as Intermediate Switch Boards (ISBs). Each NSB has eight switch slots for server-to-switch communication and eight switch slots for switch-to-switch communication. An eight NSB system:

- Has a total of 64 server-to-switch slots supporting up to 128 server-to-switch links
- Requires 128 SPC cards (8 per NSB plus 16 per ISB) and 128 switch-to-switch cables for switch-to-switch communication
- The total number of cables and SPC cards required is the sum of the switch-to-switch and server-to-switch requirements

Fiber optic switch cable connections

If you are using the information in this section to connect fiber optic cables, remember that:

- Ordering one fiber optic cable feature code delivers a cable pair
- If the port on the first switch is listed as T1 and the associated port on the second switch is also listed as a T1 port, then the actual fiber optic cable connections are:
  - The first cable of the pair connects Switch 1 T1i to Switch 2 T1o
  - The second cable of the pair connects Switch 1 T1o to Switch 2 T1i
- If the port on the first switch is listed as T1 and the associated port on the second switch is listed as a T2 port, then the actual fiber optic cable connections are:
  - The first cable of the pair connects Switch 1 T1i to Switch 2 T2o
  - The second cable of the pair connects Switch 1 T1o to Switch 2 T2i
- When labeling fiber optic cable pairs:
  - Both cables share the same serial number
  - One end of each cable is labeled as the input end and the other end of that cable is labeled as the output end

Table 95, Table 96 on page 379, Table 97 on page 381, and Table 98 on page 382 list the port locations that must be cabled together for switch-to-switch communication in a single network system with eight NSBs.

Note: To maintain cooling airflow, any switch slot that does not have a cabled Switch Port Connection card installed, must be populated with a blank SPC card.

Table 95. Switch-to-switch cable connection locations for ISB 1 in a single network system with eight NSBs

NSB 1	NSB 2	NSB 3	NSB 4	NSB 5	NSB 6	NSB 7	NSB 8	ISB 1	Cable serial number
Slot C1 Port T1								Slot C1 Port T1	
	Slot C1 Port T1							Slot C1 Port T2	
		Slot C1 Port T1						Slot C2 Port T1	
			Slot C1 Port T1					Slot C2 Port T2	
				Slot C1 Port T1				Slot C3 Port T1	

Table 95. Switch-to-switch cable connection locations for ISB 1 in a single network system with eight NSBs (continued)

NSB 1	NSB 2	NSB 3	NSB 4	NSB 5	NSB 6	NSB 7	NSB 8	ISB 1	Cable serial number
					Slot C1 Port T1			Slot C3 Port T2	
						Slot C1 Port T1		Slot C4 Port T1	
							Slot C1 Port T1	Slot C4 Port T2	
Slot C5 Port T1								Slot C5 Port T1	
	Slot C5 Port T1							Slot C5 Port T2	
		Slot C5 Port T1						Slot C6 Port T1	
			Slot C5 Port T1					Slot C6 Port T2	
				Slot C5 Port T1				Slot C7 Port T1	
					Slot C5 Port T1			Slot C7 Port T2	
						Slot C5 Port T1		Slot C8 Port T1	
							Slot C5 Port T1	Slot C8 Port T2	
Slot C9 Port T1								Slot C9 Port T1	
	Slot C9 Port T1							Slot C9 Port T2	
		Slot C9 Port T1						Slot C10 Port T1	
			Slot C9 Port T1					Slot C10 Port T2	
				Slot C9 Port T1				Slot C11 Port T1	
					Slot C9 Port T1			Slot C11 Port T2	
						Slot C9 Port T1		Slot C12 Port T1	
							Slot C9 Port T1	Slot C12 Port T2	
Slot C13 Port T1								Slot C13 Port T1	
	Slot C13 Port T1							Slot C13 Port T2	
		Slot C13 Port T1						Slot C14 Port T1	

Table 95. Switch-to-switch cable connection locations for ISB 1 in a single network system with eight NSBs (continued)

NSB 1	NSB 2	NSB 3	NSB 4	NSB 5	NSB 6	NSB 7	NSB 8	ISB 1	Cable serial number
			Slot C13 Port T1					Slot C14 Port T2	
				Slot C13 Port T1				Slot C15 Port T1	
					Slot C13 Port T1			Slot C15 Port T2	
						Slot C13 Port T1		Slot C16 Port T1	
							Slot C13 Port T1	Slot C16 Port T2	
Note: Use the blank labels that are pre-attached to both ends of each switch cable to record the serial number on each cable. Fiber optic cables must be labeled in pairs. Both cables of the pair share the same serial number. However, one end of each cable must be labeled for data output and the other end of the cable labeled for data input.									

Table 96. Switch-to-switch cable connection locations for ISB 2 in a single network system with eight NSBs

NSB 1	NSB 2	NSB 3	NSB 4	NSB 5	NSB 6	NSB 7	NSB 8	ISB 2	Cable serial number
Slot C1 Port T2								Slot C1 Port T1	
	Slot C1 Port T2							Slot C1 Port T2	
		Slot C1 Port T2						Slot C2 Port T1	
			Slot C1 Port T2					Slot C2 Port T2	
				Slot C1 Port T2				Slot C3 Port T1	
					Slot C1 Port T2			Slot C3 Port T2	
						Slot C1 Port T2		Slot C4 Port T1	
							Slot C1 Port T2	Slot C4 Port T2	
Slot C5 Port T2								Slot C5 Port T1	
	Slot C5 Port T2							Slot C5 Port T2	
		Slot C5 Port T2						Slot C6 Port T1	
			Slot C5 Port T2					Slot C6 Port T2	
				Slot C5 Port T2				Slot C7 Port T1	

Table 96. Switch-to-switch cable connection locations for ISB 2 in a single network system with eight NSBs (continued)

NSB 1	NSB 2	NSB 3	NSB 4	NSB 5	NSB 6	NSB 7	NSB 8	ISB 2	Cable serial number
					Slot C5 Port T2			Slot C7 Port T2	
						Slot C5 Port T2		Slot C8 Port T1	
							Slot C5 Port T2	Slot C8 Port T2	
Slot C9 Port T2								Slot C9 Port T1	
	Slot C9 Port T2							Slot C9 Port T2	
		Slot C9 Port T2						Slot C10 Port T1	
			Slot C9 Port T2					Slot C10 Port T2	
				Slot C9 Port T2				Slot C11 Port T1	
					Slot C9 Port T2			Slot C11 Port T2	
						Slot C9 Port T2		Slot C12 Port T1	
							Slot C9 Port T2	Slot C12 Port T2	
Slot C13 Port T2								Slot C13 Port T1	
	Slot C13 Port T2							Slot C13 Port T2	
		Slot C13 Port T2						Slot C14 Port T1	
			Slot C13 Port T2					Slot C14 Port T2	
				Slot C13 Port T2				Slot C15 Port T1	
					Slot C13 Port T2			Slot C15 Port T2	
						Slot C13 Port T2		Slot C16 Port T1	
							Slot C13 Port T2	Slot C16 Port T2	

Note: Use the blank labels that are pre-attached to both ends of each switch cable to record the serial number on each cable. Fiber optic cables must be labeled in pairs. Both cables of the pair share the same serial number. However, one end of each cable must be labeled for data output and the other end of the cable labeled for data input.

Table 97. Switch-to-switch cable connection locations for ISB 3 in a single network system with eight NSBs

NSB 1	NSB 2	NSB 3	NSB 4	NSB 5	NSB 6	NSB 7	NSB 8	ISB 3	Cable serial number
Slot C2 Port T1								Slot C1 Port T1	
	Slot C2 Port T1							Slot C1 Port T2	
		Slot C2 Port T1						Slot C2 Port T1	
			Slot C2 Port T1					Slot C2 Port T2	
				Slot C2 Port T1				Slot C3 Port T1	
					Slot C2 Port T1			Slot C3 Port T2	
						Slot C2 Port T1		Slot C4 Port T1	
							Slot C2 Port T1	Slot C4 Port T2	
Slot C6 Port T1								Slot C5 Port T1	
	Slot C6 Port T1							Slot C5 Port T2	
		Slot C6 Port T1						Slot C6 Port T1	
			Slot C6 Port T1					Slot C6 Port T2	
				Slot C6 Port T1				Slot C7 Port T1	
					Slot C6 Port T1			Slot C7 Port T2	
						Slot C6 Port T1		Slot C8 Port T1	
							Slot C6 Port T1	Slot C8 Port T2	
Slot C10 Port T1								Slot C9 Port T1	
	Slot C10 Port T1							Slot C9 Port T2	
		Slot C10 Port T1						Slot C10 Port T1	
			Slot C10 Port T1					Slot C10 Port T2	
				Slot C10 Port T1				Slot C11 Port T1	
					Slot C10 Port T1			Slot C11 Port T2	
						Slot C10 Port T1		Slot C12 Port T1	

Table 97. Switch-to-switch cable connection locations for ISB 3 in a single network system with eight NSBs (continued)

NSB 1	NSB 2	NSB 3	NSB 4	NSB 5	NSB 6	NSB 7	NSB 8	ISB 3	Cable serial number
							Slot C10 Port T1	Slot C12 Port T2	
Slot C14 Port T1								Slot C13 Port T1	
	Slot C14 Port T1							Slot C13 Port T2	
		Slot C14 Port T1						Slot C14 Port T1	
			Slot C14 Port T1					Slot C14 Port T2	
				Slot C14 Port T1				Slot C15 Port T1	
					Slot C14 Port T1			Slot C15 Port T2	
						Slot C14 Port T1		Slot C16 Port T1	
							Slot C14 Port T1	Slot C16 Port T2	
Note: Use the blank labels that are pre-attached to both ends of each switch cable to record the serial number on each cable. Fiber optic cables must be labeled in pairs. Both cables of the pair share the same serial number. However, one end of each cable must be labeled for data output and the other end of the cable labeled for data input.									

Table 98. Switch-to-switch cable connection locations for ISB 4 in a single network system with eight NSBs

NSB 1	NSB 2	NSB 3	NSB 4	NSB 5	NSB 6	NSB 7	NSB 8	ISB 4	Cable serial number
Slot C2 Port T2								Slot C1 Port T1	
	Slot C2 Port T2							Slot C1 Port T2	
		Slot C2 Port T2						Slot C2 Port T1	
			Slot C2 Port T2					Slot C2 Port T2	
				Slot C2 Port T2				Slot C3 Port T1	
					Slot C2 Port T2			Slot C3 Port T2	
						Slot C2 Port T2		Slot C4 Port T1	
							Slot C2 Port T2	Slot C4 Port T2	
Slot C6 Port T2								Slot C5 Port T1	

Table 98. Switch-to-switch cable connection locations for ISB 4 in a single network system with eight NSBs (continued)

NSB 1	NSB 2	NSB 3	NSB 4	NSB 5	NSB 6	NSB 7	NSB 8	ISB 4	Cable serial number
	Slot C6 Port T2							Slot C5 Port T2	
		Slot C6 Port T2						Slot C6 Port T1	
			Slot C6 Port T2					Slot C6 Port T2	
				Slot C6 Port T2				Slot C7 Port T1	
					Slot C6 Port T2			Slot C7 Port T2	
						Slot C6 Port T2		Slot C8 Port T1	
							Slot C6 Port T2	Slot C8 Port T2	
Slot C10 Port T2								Slot C9 Port T1	
	Slot C10 Port T2							Slot C9 Port T2	
		Slot C10 Port T2						Slot C10 Port T1	
			Slot C10 Port T2					Slot C10 Port T2	
				Slot C10 Port T2				Slot C11 Port T1	
					Slot C10 Port T2			Slot C11 Port T2	
						Slot C10 Port T2		Slot C12 Port T1	
							Slot C10 Port T2	Slot C12 Port T2	
Slot C14 Port T2								Slot C13 Port T1	
	Slot C14 Port T2							Slot C13 Port T2	
		Slot C14 Port T2						Slot C14 Port T1	
			Slot C14 Port T2					Slot C14 Port T2	
				Slot C14 Port T2				Slot C15 Port T1	
					Slot C14 Port T2			Slot C15 Port T2	
						Slot C14 Port T2		Slot C16 Port T1	

Table 98. Switch-to-switch cable connection locations for ISB 4 in a single network system with eight NSBs (continued)

NSB 1	NSB 2	NSB 3	NSB 4	NSB 5	NSB 6	NSB 7	NSB 8	ISB 4	Cable serial number
							Slot C14 Port T2	Slot C16 Port T2	
Note: Use the blank labels that are pre-attached to both ends of each switch cable to record the serial number on each cable. Fiber optic cables must be labeled in pairs. Both cables of the pair share the same serial number. However, one end of each cable must be labeled for data output and the other end of the cable labeled for data input.									

Dual network system with 16 NSBs

A dual network system with sixteen Node Switch Boards (NSBs) also requires eight switches configured as Intermediate Switch Boards (ISBs). Each NSB has eight switch slots for server-to-switch communication and eight switch slots for switch-to-switch communication. An sixteen NSB system:

- Has a total of 128 server-to-switch slots supporting 256 server-to-switch links
- Requires 256 SPC cards (8 per NSB plus 16 per ISB) and 256 switch-to-switch cables for switch-to-switch communication
- The total number of cables and SPC cards required is the sum of the switch-to-switch and server-to-switch requirements

Each network of a dual network configuration with 16 NSBs and 256 links uses the same configuration as a fully populated single network with 8 NSBs and 128 links. In other words, a two network configuration with 16 NSBs is simply two single networks with 8 NSBs. Refer to Figure 73 on page 346 for an illustration of this configuration.

Notes:

1. Connect the switch-to-switch cables for this configuration by applying the connection locations described in “Single network system with 8 NSBs” on page 377 to each of the individual networks.
2. For information on cabling networks with 130 to 254 links, refer to “Cabling non-standard networks” on page 338.

Determining frame spacing for frame-to-frame switch cables

Switch cables for routing the network between frames are available as 10 m copper, 10 m fiber optic, 20 m fiber optic, 30 m fiber optic, and 40 m fiber optic. In addition, 1.2 m copper, 3 m copper, and 3.5 m fiber optic switch cables are also available.

To determine the frame spacing requirements:

1. Calculate the maximum space between frames based on switch cable length using the following formula:

Cable length considerations for maximum frame spacing

Cable Length = (Floor Distance) + (2 x Floor Depth) + (Frame Routing)

Where:

- *Floor Distance* = The manhattan distance between frames; the sum of the x and y distances following the 90-degree junctions
- *Floor Depth* = Raised-floor depth measured from the surface of the subfloor to the top surface of the raised floor.
- *Frame Routing* = The length of cable required within each frame:
  - If frames are facing in the same direction – 2 m (6.5 ft.)
  - If frames are facing in opposite directions – 2.8 m (9.5 ft.)

2. Develop your floor plan to determine actual frame placement (refer to “Floor plans” on page 298)
3. Determine the quantity and lengths of cables you need and record that information

Server-to-switch cable connections

Note: This section provides information on server-to-switch cabling. Please refer to “Switch-to-switch cable connections” on page 341 for information on making those connections.

The information in this section provides a detailed look at the connections you need to make between the Switch Port Connection cards in a Node Switch Board (NSB) and the server mounted Switch Network Interfaces (SNIs). While you are installing any cables, record the cable serial number on the pre-attached label at each end of the switch cable. Make certain that you also record the serial numbers in the “Cable S/N” column of the cabling charts. The cable serial numbers are used to track individual cables in the future.

The following cable options are available for server-to-switch connections:

- Copper switch cable options for p5-575 servers:
  - 1.2 m (**FC 3161**)
  - 3 m (**FC 3166**)
  - 10 m (**FC 3167**)
- Fiber optic switch cable pair options for p5-590 and p5-595 servers:
  - 3.5 m (**FC 7923**)
  - 10 m (**FC 7962**)
  - 20 m (**FC 3256**)
  - 30 m (**FC 7963**)
  - 40 m (**FC 3257**)

Note: If you have a mix of p5-575 servers and p5-590 or p5-595 servers, you may have to make some adjustments to the connection order calculations for server-to-switch cabling. These adjustments are required to make sure that the copper cable connections and fiber optic cable connections are properly distributed. Refer to “Cabling non-standard networks” on page 338 for additional information.

Determining server-to-switch cable locations

Primary goals

There are three primary goals associated with the information in this section:

1. Assess your network for the switch port connection locations
2. Inventory the external SNI links on each server
3. Associate each switch port location with a specific SNI link and assign a connection order for each cable

Note: The information in this unit only applies to server-to-switch cables. “Switch-to-switch cable connections” on page 341 provides information on making those connections.

Cluster 1600 configuration rules make it possible to predefine *switch-to-switch* connections for the HPS. In contrast, the port locations for *server-to-switch* connections are dependent on the size of the network. Because of that, the port locations for server-to-switch connections must be calculated for each network. The following sections provide information and procedures for making the associations between external SNI links and Switch Port Connection cards:

- “Determining switch port locations for SNI links” on page 387
- “Process example: Determining switch port locations for SNI links” on page 412
- “Reference tables and templates” on page 415

Determining switch port locations for SNI links

Procedure goals

As you work through this procedure, you will:

1. Assess your network requirements and associate the SNI links into groups.
2. Create switch port connection tables based on the number of links in your system.
3. Create a server-SNI table that lists the location of each SNI in your network.
4. Combine the information on the server-SNI table with the information on the switch tables to associate a specific SNI link with a specific port on a Switch Port Connection card. Using that information you will be able to cable each external SNI link to the correct switch port.

Note: This procedure does not include switch-to-switch connections between NSBs or ISBs. Also, in this exercise, the term ″switch″ refers to an NSB. Intermediate Switch Boards are referred to as ISBs.

Step 1: Assess your network

Refer to the sections noted and document the following information:

- Determine the number of links in your system (refer to: “Network link requirements” on page 308)
- Determine the number of Switch Port Connection cards required (refer to: “Switch Port Connection card requirements” on page 316)
- Determine the number of switches (refer to: “Determining the number of High Performance Switches required” on page 319)

Step 2: Associate SNI links into switch connection groups

This information will give you a rough view of how your network cables are going to be configured. Later in the procedure, you will refine the link group information and assign specific switch ports to each link. At this point however, you may want to record your results by sketching each switch and noting the number of links that will connect to each.

Remember:

- Each switch supports eight *server-to-switch*, Switch Port Connection cards
- Each Switch Port Connection card supports two SNI links
- Therefore, each switch supports a maximum of sixteen SNI links for *server-to-switch* connections
- The switch network may have either:
  - A single network with all switches connected to one fabric
  - Dual networks with half of the total number of switches on the fabric for each network
- Systems using a mix of fiber optic and copper cable SPC cards configured for *server-to-switch* communication have specific installation planning requirements that must be met for proper switch cable distribution. Refer to “Cabling non-standard networks” on page 338 for additional information.

In “Step 1: Assess your network,” you reviewed your network requirements. Using the number of links required in your network, refer to the following sections for instructions to associate links with switches:

- “2 to 16 links” on page 388
- “18 to 32 links” on page 388
- “34 to 48 links” on page 388
- “50 to 64 links” on page 388
- “66 to 80 links” on page 389
- “82 to 96 links” on page 389

- "98 to 112 links" on page 390
- "114 to 128 links" on page 390
- "256 links" on page 391

2 to 16 links:

Single network system
If the number of links is less than or equal to 16, then all links go to one switch configured as an NSB

Dual network system
Dual network systems are not allowed with the switch configuration required for this number of links.

18 to 32 links:

Single network system
If your network requires between 18 and 32 links, the network requires two NSBs. In this configuration, you must divide the link pairs equally between the paired switches. For example, if your network has 30 links (15 link pairs), one switch will have 7 link pairs and the other switch will have 8 link pairs.

Dual network system
If your network requires between 18 and 32 links, the total system requires two NSBs with one NSB on each network. In this configuration, you must divide the links equally between the networks. In other words, each 2-Link SNI has one link assigned to each network.

34 to 48 links:

Single network system
If you network requires between 34 and 48 links, three NSBs are required. Two NSBs are paired and the third NSBs is non-paired. To determine how many links go to the non-paired switch:

1. The first group of 32 links is divided equally between the paired switches (16 links to each NSB)
2. The number of links on the non-paired switch = total number of links – 32

Dual network systems
Dual network systems are not allowed with the switch configuration required for this number of links.

50 to 64 links:

Single network systems
If your system has between 50 and 64 links, the network requires four NSBs (and two ISBs). This configuration will have two pairs of NSB switches. The first NSB pair will be fully populated. Divide the remaining links equally between the two NSBs of the second pair. To determine how many links go to the second switch pair:

1. The first group of 32 links is divided equally between the first switch pair (16 links to each NSB)
2. The number of links to be divided equally between the second switch pair = the total number of links – 32
   - Depending on network configuration, one switch in the second pair may have more connections than the other switch. For example if your network has a total of 54 links, 32 links will be connected to the first switch pair. This leaves 22 links (11 link pairs) that must be connected to the second switch pair. Therefore, one switch will have 6 link pairs and the other switch will have 5 link pairs.
3. If the number of links equals 64, then all four switches will be fully populated

Dual network systems

A dual network system with 50 to 64 links requires four NSBs; ISBs are not required. Each network in this system will have one pair of NSBs. The first NSB on each network will be fully populated and half of the remaining links will be connected to the second NSB on each network.

1. Working with the first set of 32 links (16 link pairs), assign one link from each SNI link pair to the first switch on the first network and assign the second link from the same SNI link pair to the first switch on the second switch network. Since 16 links are assigned to the first switch on each network, both of these switches will be fully populated.
2. Divide the remaining links equally between the second switch on each network. In other words, the number of links connected to the second switch on each network = ((total number of links – 32) ÷ 2).
   - You must connect the same number of links to the second switch on each network. For example, if your total system has 54 links, the first switch on each network will be fully populated with 16 links. This leaves 22 links that must be connected to the second switch on each of the networks. Therefore the second switch on each network will have 11 links connected.
3. If the number of links equals 64, then both switches on each network will be fully populated.

66 to 80 links:

Single network system

If your network has between 66 and 80 links, the network requires five NSB switches (and four ISBs). This configuration will have two pairs of NSB switches and one non-paired NSB switch. To determine how many links go to the non-paired switch:

1. The first group of 64 links is divided equally between the two switch pairs (16 to each)
2. The number of links on the non-paired switch = total number of links – 64
3. If the number of links equals 80, then all five switches will be fully populated

Dual network system

Dual network systems are not allowed with the switch configuration required for this number of links.

82 to 96 links:

Single network system

If your network has between 82 and 96 links, the network requires six NSB switches (and four ISBs). This configuration will have three pairs of NSB switches. The first two NSB switch pairs will be fully populated. Divide the remaining links between the two switches of the third NSB pair. To determine how many links go to the third switch pair:

1. The first group of 64 links is divided equally between the first two switch pairs (16 to each)
2. The number of links to be divided between the third switch pair = total number of links – 64
3. Depending on network configuration, one switch in the third pair may have more connections than the other switch.
4. If the number of links equals 96, then all six switches will be fully populated

Dual network system

A dual network system with 82 to 96 links requires six NSBs; ISBs are not required. Each network in this system will have three NSBs. The first two NSBs on each network will be fully populated and half of the remaining links will be connected to the third NSB on each network.

1. Working with the first set of 32 links (16 link pairs), assign one link from each SNI link pair to the first switch on the first network and assign the second link from the same SNI link pair to the first switch on the second switch network.
2. Working with the second set of 32 links (16 link pairs), assign one link from each SNI link pair to the second switch on the first network and assign the second link from the same SNI link pair to the second switch on the second switch network.

3. This distributes 64 links across the first two switches on each network and fully populates these switches.
4. Divide the remaining links equally between the third switch on each network. In other words, the number of links connected to the third switch on each network = ((total number of links – 64) ÷ 2).
   - You must connect the same number of links to the third switch on each network. For example, if the total system has 86 links, the first two switches on each network will be fully populated with 64 links. This leaves 22 links that must be connected to the third switch on each network. Therefore the third switch on network will have 11 links connected.
5. If the number of links equals 96, then all three switches on each network will be fully populated.

98 to 112 links:

Single network system

If your network has between 98 and 112 links, the network requires seven NSB switches (and four ISBs). This configuration will have three pairs of NSB switches and one non-paired NSB switch. To determine how many links go to the non-paired switch:

1. The first group of 96 links is divided equally between the three switch pairs (16 to each)
2. The number of links on the non-paired switch = total number of links – 96
3. If the number of links equals 112, then all five switches will be fully populated

Dual network system

Dual network systems are not allowed with the switch configuration required for this number of links.

114 to 128 links:

Single network system

If your network has between 114 and 128 links, the network requires eight NSB switches (and four ISBs). This configuration will have four pairs of NSB switches. The first three NSB switch pairs will be fully populated. Divide the remaining links between the two switches of the fourth NSB pair. To determine how many links go to the fourth switch pair:

1. The first group of 96 links is divided equally between the first three switch pairs (16 to each)
2. The number of links to be divided between the fourth switch pair = total number of links – 96
3. Depending on network configuration, one switch in the fourth pair may have more connections than the other switch.
4. If the number of links equals 128, then all eight switches will be fully populated

Dual network system

A dual network system with 114 to 128 links requires eight NSB switches (and four ISBs). Each network in this system will have four NSBs (and two ISBs). The first three NSBs on each network will be fully populated and half of the remaining links will be connected to the fourth NSB on each network.

1. Working with the first set of 32 links (16 link pairs), assign one link from each SNI link pair to the first switch on the first network and assign the second link from the same SNI link pair to the first switch on the second network.
2. Working with the second set of 32 links (16 link pairs), assign one link from each SNI link pair to the second switch on the first network and assign the second link from the same SNI link pair to the second switch on the second network.
3. Working with the third set of 32 links (16 link pairs), assign one link from each SNI link pair to the third switch on the first network and assign the second link from the same SNI link pair to the third switch on the second network.
4. This distributes 96 links across the first three switches on each network and fully populates these switches.

5. Divide the remaining links equally between the fourth switch on each network. In other words, the number of links connected to the fourth switch on each network = ((total number of links – 96) ÷ 2).
   - You must connect the same number of links to the third switch on each network. For example, if your total system has 118 links, the first three switches on the two networks will be fully populated with 96 links. This leaves 22 links that must be connected to the fourth switch on each network. Therefore the fourth switch on each network will have 11 links connected.
6. If the number of links equals 128, then all four switches on each network will be fully populated.

256 links:

Note: Dual network configurations with 130 to 254 links are non-standard networks. You must work with your special bids representative to make sure that you have addressed all network planning issues. Refer to “Cabling non-standard networks” on page 338 for additional information.

Single network system

Single network systems are not allowed with the switch configuration required for this number of links.

Dual network system

If your network has 256 links, the system requires sixteen NSB switches (and eight ISBs). Each network will have four pairs of NSB switches. For cable planning purposes, treat each network as a fully populated single network with 128 links. Refer to the ″Single network system″ information in “114 to 128 links” on page 390.

Step 3: Create switch port connection tables

In this step, you will create a set of tables that will outline the NSB slots to populate with Switch Port Connection (SPC) cards, the ports that require switch cables, and the hierarchical order you will use to connect switch cables across the switches. The main tasks in this step are:
1. Bring in the switch group information from Step 2
2. Determining which switch slots have SPC cards installed
3. Using the cable installation tables to determine the connection order for each switch port
4. Saving the completed tables for reference with the server-SNI table

Note: Templates for the switch tables used in this procedure are located under “Switch port location table templates” on page 457 and the connector reference tables are located under “Switch port connection order tables” on page 415.

If an NSB is fully populated, all eight server-to-switch connector slots are populated. However if you have partially populated switches, the slot locations need to be determined for each SPC card installed in that switch. Use this procedure to determine those slots locations:
1. Table 99 summarizes the configuration information from Step 2

Table 99. Switch group listings

Links in network	Switch groups	
	Single network system	**Dual network system**
2 to 16 links	One NSB configured switch • One non-paired switch • Switch may be partially populated	**Requires** two NSB configured switches • One switch per network • Both switches **will** be partially populated • Both switches **must** have the same number of links

Table 99. Switch group listings (continued)

Links in network	Switch groups	
	Single network system	**Dual network system**
18 to 32 links	Two NSB configured switches • One switch pair • Switch pair may be partially populated	Two NSB configured switches • One switch per network • Both switches **may** be partially populated • Both switches **must** have the same number of links
34 to 48 links	Three NSB configured switches • One fully populated switch pair • One non-paired switch • Non-paired switch may be partially populated	**Requires** four NSB configured switches • Two switches per network • One switch per network**may** be partially populated • One switch per network **will** be partially populated • All switches **must** have the same number of links • ISB configured switches are not required
50 to 64 links	Four NSB configured switches • Two switch pairs • One fully populated switch pair • Second switch pair may be partially populated • Requires two ISB configured switches	Four NSB configured switches • Two switches per network • One fully populated switch per network • One switch per network **may** be partially populated • Partially populated switches **must** have the same number of links • ISB configured switches are not required
66 to 80 links	Five NSB configured switches • Two fully populated switch pairs • One non-paired switch • Non-paired switch may be partially populated • Requires four ISB configured switches	**Requires** six NSB configured switches • Three switches per network • Two switches per network **may** be fully populated • One switch per network **will** be partially populated • Partially populated switches **must** have the same number of links • ISB configured switches are not required
82 to 96 links	Six NSB configured switches • Three switch pairs • Two fully populated switch pairs • Third switch pair may be partially populated • Requires four ISB configured switches	Six NSB configured switches • Three switches per network • Two fully populated switches per network • One switch per network **may** be partially populated • Partially populated switches **must** have the same number of links • ISB configured switches are not required
98 to 112 links	Seven NSB configured switches • Three fully populated switch pairs • One non-paired switch • Non-paired switch may be partially populated • Requires four ISB configured switches	**Requires** eight NSB configured switches • Four switches per network • Three switches per network **may** be fully populated • One switch per network **will** be partially populated • Partially populated switches **must** have the same number of links • Four ISB configured switches are required (two per network)

Table 99. Switch group listings (continued)

Links in network	Switch groups	
	Single network system	**Dual network system**
114 to 128 links	Eight NSB configured switches • Four switch pairs • Three fully populated switch pairs • Fourth switch pair may be partially populated • Requires four ISB configured switches	Eight NSB configured switches • Four switches per network • Three fully populated switches per network • One switch per network **may** be partially populated • Partially populated switches **must** have the same number of links • Four ISB configured switches are required (two per network)
256 links	Not supported	Sixteen fully populated NSB plus eight ISB switches (8 NSBs plus 4 ISBs on each network) **Note:** For information on systems with 130 to 254 links, refer to "Cabling non-standard networks" on page 338.

2. Using the number of NSBs required for your network, find the specific switch port location table for **each** switch in your system. These tables are listed under "Switch port location table templates" on page 457). Copy the specific tables that you will need to use for the switches in your network.

   Notes:

   a. There are specific tables for each switch in the network. Make certain that you use the correct table for each switch in your configuration. Table 100 illustrates an empty template for switch number 1.

   b. **If you are configuring a dual network system:** Each network must be configured the same way as a single network system having that number of switches. For example, consider a dual network system with the four switches. Each network has two switches and must be configured as if it were a single network system of that size. Therefore you will use the configuration tables for switch one and switch two for the NSBs on each network. You will not use the configuration tables for switch three or switch four.

Table 100. Sample switch port location table for switch 1

Switch number	Switch chip 5 (slots 3 and 4)		Switch chip 7 (slots 7 and 8)		Switch chip 6 (slots 11 and 12)		Switch chip 4 (slots 15 and 16)	
1	**Port location**	**CO**	**Port location**	**CO**	**Port location**	**CO**	**Port location**	**CO**
Odd numbered NSB slots	S1C3T1		S1C7T1		S1C11T1		S1C15T1	
	S1C3T2		S1C7T2		S1C11T2		S1C15T2	
Even numbered NSB slots	S1C4T1		S1C8T1		S1C12T1		S1C16T1	
	S1C4T2		S1C8T2		S1C12T2		S1C16T2	
Notes: 1. CO: Connection Order 2. Port locations listed in this table are for server to switch connections only								

3. Using the table for **each** NSB configured switch, mark the cell for any slot that will not have SPC cards installed for server-to-switch communication. Refer to Figure 74 on page 394 for an example of how a table for a switch with five SPC cards installed would look after this step is completed.

- If a switch is fully populated, all server-to-switch slots will have a SPC card installed and you will not mark any cells in the table for that switch
- If a switch is partially populated you will have to determine which slots will not be populated
  a. Refer to the link calculations you completed in Step 2
  b. Determine how many SPC cards will be installed in each partially populated switch
  c. Switch Port Connection cards must be installed in the specific order given in the following list. If a switch requires four SPC cards, use the first four slots specified. If seven cards are required, use the first seven slots specified. For all instances, use the installation order proceeds as follows:
    1) slot 3
    2) slot 7
    3) slot 11
    4) slot 15
    5) slot 4
    6) slot 8
    7) slot 12
    8) slot 16

Note: Switch Port Connection cards for the initial system are installed during manufacturing. However, you need to complete this procedure to prepare for switch cable installation. This procedure is also required for any system expansion.

Switch number	**Switch chip 5 (slots 3 and 4)**		**Switch chip 7 (slots 7 and 8)**		**Switch chip 6 (slots 11 and 12)**		**Switch chip 4 (slots 15 and 16)**	
1	**Port location**	**CO**	**Port location**	**CO**	**Port location**	**CO**	**Port location**	**CO**
Odd numbered NSB slots	S1C3T1		S1C7T1		S1C11T1		S1C15T1	
	S1C3T2		S1C7T2		S1C11T2		S1C15T2	
Even numbered NSB slots	S1C4T1		S1C8T1		S1C12T1		S1C16T1	
	S1C4T2		S1C8T2		S1C12T2		S1C16T2	

Notes:
1. CO: Connection Order
2. Port locations listed in this table are for server to switch connections only

Figure 74. Partially completed switch port connection table for an NSB with five Switch Port Connection cards.

How this applies to switch port connection order

Although the installation order may seem unimportant, it is important for planning purposes. The importance is related to the goal of spreading your network connections across several switch chips. To assist you, manufacturing uses a different installation order than what you will use as a connection order for cabling the Switch Port Connection cards. By using different orders, the network connections get distributed across the switch chips and reducing the chance of single point failures for each server SNI.

To illustrate the difference between installation order and connection order, look at a fully populated switch. On that switch, the SPC cards were preinstalled into slots 3, 7, 11, 15, 4, 8, 12, and 16. However, when you cable the switch, the connection order proceeds from left to right across the switch. Therefore the connection order for that switch would have the sequence, 3, 4, 7, 8, 11, 12, 15, and 16. Referring back to the single switch with five SPC cards mentioned above, the connection order for that switch would be 3, 4, 7, 11, and 15.

4. Find the tables listing the switch port connection order for your network

   In the previous sub-step, you created a set of tables listing the switch slots that will be populated with SPC cards. Each of those tables has a column for connection order. In this sub-step, you will find a set of tables that list specific network configurations and the connection order for each switch port in that configuration. You will take the information from these switch port connection order tables and enter the installation sequence in the tables (like Figure 74 on page 394) from the previous step.

   To determine the connection order for each switch port in your system, you need to know the number of networks, NSBs, and links used in your system. With that information you can find the specific tables for each configuration. Based on the number of switches and networks in your system, select the heading for your switch configuration and then find the specific tables for the number of links in your system. Copy all tables required for your total system and continue with the next sub-step.

   - “Systems with 1 NSB per network” on page 415
   - “Systems with 2 NSBs per network” on page 420
   - “Systems with 3 NSBs per network” on page 425
   - “Systems with 4 NSBs per network” on page 430
   - “Systems with 5 NSBs per network (single network configurations only)” on page 435
   - “Systems with 6 NSBs per network (single network configurations only)” on page 439
   - “Systems with 7 NSBs per network (single network configurations only)” on page 445
   - “Systems with 8 NSBs per network (single network configurations only)” on page 449
   - “Dual network systems with 16 NSBs” on page 454

   Notes:

   a. You must use these tables to determine the installation sequence. This requirement comes about because you must cable the ports from left to right as you see the SPC cards on the switch. The switch ports are not cabled using the manufacturing installation order. Since the manufacturing installation order is different than the cable connection order, the connection order varies with the number of SPC cards installed.
   b. If you are configuring a dual network system, make certain that you use the correct tables. For example, if you have a dual network with 4 NSBs in the system, you should use duplicate copies of the tables for a single network, 2 NSB system. You would not use the tables for a single network, 4 NSB system.

5. Using the “Switch port connection order tables” on page 415 you copied in the previous sub-step, fill in the connection order columns for each switch in your system. Additional instructions are given at the beginning of the section for each table group. The order for completing the switch port connection tables is as follows:

   a. Complete the tables for all fully populated switch pairs

b. Complete the tables for any non-paired switch or partially populated switch pairs

For example, to complete the switch port connection table for the single switch network with five SPC cards, you would refer to “Systems with 1 NSB per network” on page 415 and look for the table that lists five SPC cards installed (refer to Table 114 on page 418). Using the information in that table, the completed switch port connection table would look like Table 101. For additional examples refer to “Examples of completed switch port connection tables” on page 454.

Table 101. Sample switch port location table for single switch with five Switch Port Connection cards, completed

Switch number	Switch chip 5 (slots 3 and 4)		Switch chip 7 (slots 7 and 8)		Switch chip 6 (slots 11 and 12)		Switch chip 4 (slots 15 and 16)	
1	Port location	CO	Port location	CO	Port location	CO	Port location	CO
Odd numbered NSB slots	S1C3T1	1	S1C7T1	5	S1C11T1	7	S1C15T1	9
	S1C3T2	2	S1C7T2	6	S1C11T2	8	S1C15T2	10
Even numbered NSB slots	S1C4T1	3	S1C8T1		S1C12T1		S1C16T1	
	S1C4T2	4	S1C8T2		S1C12T2		S1C16T2	

Notes:
1. CO: Connection Order
2. Port locations listed in this table are for server to switch connections only

6. When all switch port location tables are complete, save them. In the next section (Step 4), you will complete a server-SNI table that assigns an address and connection order to each SNI link. After you complete the server-SNI table, you will compare the connection order listed in the server-SNI table to the connection order listed in the switch port connection tables. By matching the connection order of an SNI link to the connection order of a switch port, you will be able to assign a specific switch port to each SNI link.

Step 4: Create the server-SNI table

In Step 3, you completed a set of tables listing the port locations and connection order for each port on the Switch Port Connection cards in your network. This gave you the conceptual layout for the switch side of your switch network. In this step, you will create a table that provides a similar view for the server side of your network.

Using the procedure in this section, you will create a single table that lists: each server connected to the switch network, the SNIs installed in each server, and the switch cable ports associated with each SNI. As you complete this table, you will also generate a text address, called the **N_S_Q** address, for each server SNI port. “The SNI port address (N_S_Q)” on page 397 explains the format of this address.

Note: The **N_S_Q** port address only applies to network cable planning procedures. The **N_S_Q** information does not use component data and it does not apply to FRU locations.

In addition to creating SNI port addresses, in this step you will also complete the following critical planning tasks:

- You will assign a connection order for each external SNI port and use that number to associate each SNI port with a switch port. If an SNI port has the same connection order as a switch port (assigned in Step 3) those ports are associated and must be cabled together. This task provides that information and allows you to connect the server side of the network with the switch side of the network.
- If you are cabling a dual network system, you will use the **Q** number to distribute SNI links to each network. To set up each network of the switch fabric:
  – Any SNI port having an odd **Q** number is assigned to network 1
  – Any SNI port having an even **Q** number is assigned to network 2

- For example, all **Q1** ports would be assigned to network 1 while all **Q2** ports would be assigned to network 2.

- Record switch cable serial numbers in the table and on both ends of each switch cable. This allow you to verify that the correct cable connects each external SNI port to its associated port on a Switch Port Connection card. You also need to maintain these records for efficient network maintenance.

  Note: The customer determines the format for creating cable serial numbers. However, serial numbers should follow a logical order and allow for network expansion.

The SNI port address (N_S_Q): Building an efficient switch network requires cable connections between specific endpoints on the switch fabric. In previous steps, you identified specific endpoints on the switch side of the fabric. In this step, you will generate a text address for the specific SNI endpoints on the server side of the fabric. The endpoint ID provided by the SNI port address make it possible for you to complete the switch cable connection between each server endpoint and the specific corresponding switch endpoint.

The SNI address contains three user generated variables that define a specific external port on each SNI. These variables are:

1. The server number: $\mathbf{N_x}$
2. The location of the SNI in the server: **S1, S2, S3, or S4**
3. The port number on the SNI: **Q1 or Q2**

Server number

Since the SNI port address is an arbitrary number and you could assign any value to the server number (**N**). For consistency however, you should assign N1 to the first server installed. You should also increment N by one as you install each additional server. Therefore, N2 would be the second server installed and N3 would be the third server installed. This provides a logical sequence that allows for any number of servers in your system.

SNI location

The type of server and where you place the SNI in each server defines the SNI location (**S**). For:

- p5-575 servers, the SNI must be placed on the GX bus. Configuration rules require that you alternate the SNI location between servers to simplify cable management.
  - Use **S1** for SNIs located at C66 (odd numbered servers in the frame)
  - Use **S2** for SNIs located at C65 (even numbered servers in the frame)
  - Refer to Figure 59 on page 325 for C65 and C66 locations
- p5-590 servers, SNIs must be installed **and** cabled in pairs. Each of the SNIs for these servers provides a single link. Because they are installed and cabled in pairs, you will only assign one **S** address to both SNIs in each location.
  - Use **S1** for the SNI pair located in slots 8 and 9 of node book 1 (P2)
  - Use **S2** for the SNI pair located in slots 8 and 9 of node book 2 (P3)
  - Refer to Figure 61 on page 326 for node and slot locations
- p5-595 servers, SNIs must be installed **and** cabled in pairs. Each of the SNIs for these servers provides a single link. Because they are installed and cabled in pairs, you will only assign one **S** address to both SNIs in each location.
  - Use **S1** for the SNI pair located in slots 8 and 9 of node 1 (P2)
  - Use **S2** for the SNI pair located in slots 8 and 9 of node 2 (P3)
  - Use **S3** for the SNI pair located in slots 8 and 9 of node 3 (P4)
  - Use **S4** for the SNI pair located in slots 8 and 9 of node 4 (P5)
  - Refer to Figure 61 on page 326 for node and slot locations

SNI port number

The type of SNI and the location of the external port on the SNI defines the SNI port number (**Q**). For:

- p5-575 servers, define the SNI ports as:
  - Use **Q1** for the T1 port on the FC 7910 SNI
  - Use **Q2** for the T2 port on the FC 7910 SNI

– Refer to Figure 55 on page 315 for port locations

- p5-590 and p5-595 servers, define the SNI ports as:
  – Use **Q1** for the transmit and receive ports on the FC 7817 SNI in processor book slot 8
  – Use **Q2** for the transmit and receive ports on the FC 7817 SNI in processor book slot 9
  – Refer to Figure 56 on page 316 for processor book slot locations
- **If you are cabling a dual network system:**
  – Ports with an odd **Q** number must be assigned to network 1
  – Ports with an even **Q** number must be assigned to network 2
  – Step 7 provides additional information

Notes:

1. In addition to providing a convenient way to plan and cable your network, the SNI port address also provides information that may help network maintenance. Please keep all network planning information for future reference.
2. If your network combines fiber optic and copper cables for server-to-switch communication, you **must** take specific planning actions to group SPC cards for proper switch cable distribution. Refer to "Cabling non-standard networks" on page 338 for additional information.

By combining specific values for each of these three parameters, you define an exact SNI port location on the switch fabric. For example, **N3_S2_Q1** specifies the third node installed in the network. If this is a:

- p5-575 server, the indicated port is the T1 port located at C65
- p5-590 or p5-595 server, the indicated ports are the transmit and receive ports located in slot 8 of processor book 2 (P3)

Creating the server-SNI table:

1. Table 182 on page 460 provides the template for planning the switch cable connection locations for the server side of your network; copy the pages as needed.
2. Determine the server installation order and sequentially assign **server numbers (N_x)** with server 1 being the first server installed.

   Note: The server number you assign in this procedure must agree with the server numbers you assign during network configuration.
3. Enter the server number (N_x) into table. Enter the server number on a separate line for each SNI link associated with that server. For example, if server one has one 2-Link SNI, you would enter ″N1″ in that column for the first two rows of the table. If the SNI is provides fiber optic cable ports, the pair of transmit and receive ports count as one port, not two. Use the following system with 10 SNI links as an example for this procedure:
   - Server 1 is a p5-575 with one 2-Link SNI
     – Server 1 has 2 external SNI ports, therefore you would enter ″**1**″ as the **N** value on the first and second rows of the table
   - Server 2 is a p5-575 with one 2-Link SNI
     – Server 2 has 2 external SNI ports, therefore you would enter ″**2**″ as the **N** value on the third and fourth rows of the table
   - Server 3 is a p5-575 with one 2-Link SNI
     – Server 3 has 2 external SNI ports, therefore you would enter ″**3**″ as the **N** value on the fifth and sixth rows of the table
   - Server 4 is a p5-575 with one 2-Link SNI
     – Server 4 has 2 external SNI ports, therefore you would enter ″**4**″ as the **N** value on the seventh and eighth rows of the table
   - Server 5 is a p5-575 with one 2-Link SNI
     – Server 5 has 2 external SNI ports, therefore you would enter ″**5**″ as the **N** value on the ninth and tenth rows of the table
   - Figure 75 on page 399 illustrates a server-SNI table with the **N** values entered

Server number (N)	SNI location (S1 to S4)	SNI port number (Q1 or Q2)	SNI port address (N_S_Q)	Connection order	Corresponding switch port location	Switch cable serial number
N1	S	Q				
N1	S	Q				
N2	S	Q				
N2	S	Q				
N3	S	Q				
N3	S	Q				
N4	S	Q				
N4	S	Q				
N5	S	Q				
N5	S	Q				

Figure 75. Server-SNI table with N values entered

4. Enter the **SNI locations (S1, S2, S3, or S4)** for each server.
   - On p5-575 servers:
     - Assign S1 to the SNI for the first server in the frame (SNI installed in C66 location)
     - Assign S2 to the SNI for the second server in the frame is installed in (SNI installed in C65 location)
     - This alternating pattern continues up the frame with SNIs for odd numbered nodes located in C66 and SNIs for even numbered nodes located in C65
   - On p5-595 servers:
     - Assign S1 to the first SNI pair (installed in slots 8 and 9 of the first node book (P2 position)
     - Assign S2 to the second SNI pair (installed in slots 8 and 9 of the second node book (P3 position)
     - Assign S3 to the third SNI pair (installed in slots 8 and 9 of the third node book (P4 position)
   - On p5-590 servers:
     - Assign S1 to the first SNI pair (installed in slots 8 and 9 of the first node book (P2 position)
   - Figure 76 on page 400 illustrates a server-SNI table with the **S** values entered

Server number (N)	SNI location (S1 to S4)	SNI port number (Q1 or Q2)	SNI link address (N_S_Q)	Connection order	Corresponding switch port location	Switch cable serial number
N1	**S1**	Q				
N1	**S1**	Q				
N2	**S2**	Q				
N2	**S2**	Q				
N3	**S1**	Q				
N3	**S1**	Q				
N4	**S2**	Q				
N4	**S2**	Q				
N5	**S1**	Q				
N5	**S1**	Q				

Figure 76. Server-SNI table with S values entered

5. Enter the SNI port number (**Q**) for the links in each server.
   - The assigned addresses for the external ports on a p5-575 2-Link SNI (FC 7910) as Q1 for the T1 port and Q2 for the T2 port
   - The assigned addresses for the external ports on a p5-595 1-Link SNI (FC 7817) are Q1 for the slot 8 SNI and Q2 for the slot 9 SNI
   - The assigned addresses for the external ports on a p5-590 1-Link SNI (FC 7817) are Q1 for the slot 8 SNI and Q2 for the slot 9 SNI
   - Figure 77 illustrates a server-SNI table with the **Q** values entered

Server number (N)	SNI location (S1 to S4)	SNI port number (Q1 or Q2)	SNI link address (N_S_Q)	Connection order	Corresponding switch port location	Switch cable serial number
N1	S1	**Q1**				
N1	S1	**Q2**				
N2	S2	**Q1**				
N2	S2	**Q2**				
N3	S1	**Q1**				
N3	S1	**Q2**				
N4	S2	**Q1**				
N4	S2	**Q2**				
N5	S1	**Q1**				
N5	S1	**Q2**				

Figure 77. Server-SNI table with Q values entered

6. Combine the **N, S, and Q** information from the first three columns of the table to create SNI addresses as shown in Figure 78 on page 401

Server number (N)	SNI location (S1 to S4)	SNI port number (Q1 or Q2)	SNI link address (N_S_Q)	Connection order	Corresponding switch port location	Switch cable serial number
N1	S1	Q1	**N1S1Q1**			
N1	S1	Q2	**N1S1Q2**			
N2	S2	Q1	**N2S2Q1**			
N2	S2	Q2	**N2S2Q2**			
N3	S1	Q1	**N3S1Q1**			
N3	S1	Q2	**N3S1Q2**			
N4	S2	Q1	**N4S2Q1**			
N4	S2	Q2	**N4S2Q2**			
N5	S1	Q1	**N5S1Q1**			
N5	S1	Q2	**N5S1Q2**			

Figure 78. Server-SNI table with SNI link addresses entered

7. Enter the connection order for each link using these rules:

   Single network system:

   Non-paired switches (NSB configured)

   a. The first link in the first server gets the first connection (Connection order = 1)
   b. The first link in the second server gets the second connection (Connection order = 2)
   c. The first link in the third server gets the third connection (Connection order = 3)
   d. This installation pattern continues with the first link in each of the servers until all first links have a connection order listing
   e. After all first links on each server are marked, return to the second link on the first server and assign that link the next connection order number (Connection order = N + 1)
   f. The next connection order number gets assigned to the second link on the second server (Connection order = N + 2)
   g. The next connection order number gets assigned to the third link on the third server (Connection order = N + 3)
   h. When all second links are marked, return to the third link on the lowest numbered server having SNI ports that do not have an assigned connection order
   i. Continue assigning link connection order numbers until all links are marked for connection (Connection order = N + X)

   Note: The tables illustrating the server-SNI table procedure are for a non-paired switch. The next table (Table 102) highlights information related to paired switches. The procedural tables continue below Table 102 on page 402.

   Paired switches (NSB configured)

   a. The first two links in the first server get the first connection order number (Connection order 1 entered twice, refer to Table 102 on page 402)
   b. The first two links in the second server get the second connection order number (Connection order 2 entered twice)
   c. This installation pattern continues with the first two links in each of the servers until all first link pairs have a connection order number assigned
   d. After all first link pairs on each server are marked, return to the second link pair on the first server and that link pair the next connection order number (Connection order N + 1 entered twice)

e. The next connection order number gets assigned to the second link pair on the second server (Connection order N + 2 entered twice)
f. When all second link pairs have a connection order number assigned, return to the third link pair on the lowest numbered server having SNI ports that do not have an assigned connection order
g. Continue assigning link connection order numbers until all link pairs are marked for connection (Connection order = N + X entered twice)

Note: Table 102 shows an example of connection order numbers for paired SNI links associated with a fully populated pair of switches. This table is not part of the procedure for creating the server-SNI table; it is included to illustrate the difference in connection order numbering between paired switches and non-paired switches. The tables associated with the procedure continue below Table 102.

Table 102. Example of link connection order numbering for paired switches

SNI link address (N_S_Q)	Connection order	SNI link address (N_S_Q)	Connection order	SNI link address (N_S_Q)	Connection order
N1S1Q1	**1**	N3S1Q1	**3**	N5S2Q2	**12**
N1S1Q2	**1**	N3S1Q2	**3**	N6S1Q1	**6**
N1S2Q1	**9**	N4S1Q1	**4**	N6S1Q2	**6**
N1S2Q2	**9**	N4S1Q2	**4**	N7S1Q1	**7**
N1S3Q1	**14**	N4S2Q1	**11**	N7S1Q2	**7**
N1S3Q2	**14**	N4S2Q2	**11**	N7S2Q1	**13**
N2S1Q1	**2**	N4S3Q1	**15**	N7S2Q2	**13**
N2S1Q2	**2**	N4S3Q2	**15**	N7S3Q1	**16**
N2S2Q1	**10**	N5S1Q1	**5**	N7S3Q2	**16**
N2S2Q2	**10**	N5S1Q2	**5**	N8S1Q1	**8**
		N5S2Q1	**12**	N8S1Q2	**8**

Dual network system

One NSB configured switch per network

a. The first link on the first server gets the first connection on network 1 (Connection order = 1 P1)
b. The first link on the second server gets the second connection network 1 (Connection order = 2 P1)
c. The first link on the third server gets the third connection on network 1 (Connection order = 3 P1)
d. This installation pattern continues with the first link on each server until all first links have a connection order listing for network 1
e. After all first links on each server have an assigned connection order, return to the second link on the first server
f. The second link on the first server gets the first connection on network 2 (Connection order = 1 P2)
g. The second link on the second server gets the second connection on network 2 (Connection order = 2 P2)
h. The second link on the third server gets the third connection on network 2 (Connection order = 3 P2)
i. When all second links are marked, return to the third link on the first server
   - Use the server with the lowest number having a second SNI installed
   - If all ports have an assigned connection order, this procedure is complete

j. Before you can proceed, you must verify the number listed for the last link assigned a connection order on network 1 and increment that value by one
k. Assign the new connection order number to the third link on the lowest numbered server and then assign that connection to network 1 (Connection order = N+1 P1)
l. Increment the connection order number by one and assign that value to the third link on the next server having a second SNI and then assign that connection to network 1 (Connection order = N+2 P1)
m. Continue to increment the connection order by one and assign the new value to the third link on each server having a second SNI and assign all third link connections to network 1
n. After all third links on each server have an assigned connection order, return to the fourth link on the first server
o. Before you can proceed, you must verify the number listed for the last link assigned a connection order on network 2 and increment that value by one
p. Assign the new connection order number to the fourth link on the lowest numbered server having a second SNI and then assign that connection to network 2 (Connection order = N+1 P2)
q. Increment the connection order number by one and assign that value to the fourth link on the next server having a second SNI and then assign that connection to network 2 (Connection order = N+2 P2)
r. Continue to increment the connection order by one and assign the new value to the fourth link on each server having a second SNI and assign all fourth link connections to network 2
s. After all fourth links on each server have an assigned connection order, return to the lowest numbered server having an SNI with ports that do not have an assigned connection order
   - If all SNI ports have an assigned connection order, this procedure is complete
t. Continue this procedure and assign a connection order to each remaining link. As you repeat the procedure, remember:
   - Always return to the lowest numbered server having an SNI with ports that do not have an assigned connection order
   - Starting with that server, continue with the port on each SNI having the lowest **Q** value
     – At this point, the **Q** value must be an odd number, if it is not, you made an error in this procedure
   - Assign a connection order to each port having that **Q** value and assign these links to network 1
   - When all ports having the latest, odd numbered **Q** value have an assigned connection order, return to the first server in this sequence and begin assigning connection orders to all ports having the next **Q** value
     – At this point, the **Q** value must be an even number, if it is not, you made an error in this procedure
   - Assign a connection order to each port having that **Q** value and assign these links to network 2
   - Each time you complete a sequence for an SNI link pair, return to the lowest numbered server having an SNI with ports that do not have an assigned connection order and repeat the assignment procedure until all links have a connection order

Two NSB configured switches per network

a. The first link pair in the first server gets the first connection (Connection order = 1):
   - The odd numbered SNI port (**Q1**) gets assigned to switch network 1
   - The even numbered SNI port (**Q2**) gets assigned to switch network 2
b. The first link pair in the second server gets the second connection (Connection order = 2):

- The odd numbered SNI port (**Q1**) gets assigned to switch network 1
- The even numbered SNI port (**Q2**) gets assigned to switch network 2

c. The first link pair in the third server gets the third connection (Connection order = 3):
   - The odd numbered SNI port (**Q1**) gets assigned to switch network 1
   - The even numbered SNI port (**Q2**) gets assigned to switch network 2

d. This installation pattern continues with the first link pair in each of the servers until all first links pairs have a connection order listing

e. After you have assigned a connection order to all first link pairs on each server, return to the second link pair on the first server and assign that link pair the next numeric value as a connection order

f. Increment the connection order by one and assigned that value to the second link pair on the second server

g. Increment the connection order by one and assigned that value to the third link pair on the third server

h. When you have assigned a connection order to all second link pairs, return to the third link pair on the first server

i. Continue assigning link connection order numbers until all link pairs are marked for connection

Three NSB configured switches per network

a. Use the instructions for two switches per network and assign numeric values for connection order to each SNI port until the first two switches on each network are fully populated

b. After switch one and two are fully populated, continue assigning SNI port connection order and populate the third switch using the instructions for the one network per switch
   - Increment the connection order by continuing the sequence from the last values assigned to the first two switches on each network

Four NSB configured switches per network

a. Use the instructions for two switches per network and assign numeric values for connection order to each SNI port until the first two switches on each network are fully populated

b. After switch one and two are fully populated, continue assigning SNI port connection order and populate switch three and four using the instructions for two switches per network
   - Increment the connection order by continuing the sequence from the last values assigned to the first two switches on each network

Eight NSB configured switches per network

Use the instructions for a fully populated single network with eight NSB switches. Each network in the dual network system with 16 NSBs uses this configuration on both networks. For 16 NSB configurations that are not fully populated, refer to "Cabling non-standard networks" on page 338.

Figure 79 on page 405 continues the procedure for assigning switch port locations to external SNI links and shows how the server-SNI table appears with connection orders assigned to the ports.

Server number (N)	SNI location (S1 to S4)	SNI port number (Q1 or Q2)	SNI link address (N_S_Q)	Connection order	Corresponding switch port location	Switch cable serial number
N1	S1	Q1	N1S1Q1	**1**		
N1	S1	Q2	N1S1Q2	**6**		
N2	S2	Q1	N2S2Q1	**2**		
N2	S2	Q2	N2S2Q2	**7**		
N3	S1	Q1	N3S1Q1	**3**		
N3	S1	Q2	N3S1Q2	**8**		
N4	S2	Q1	N4S2Q1	**4**		
N4	S2	Q2	N4S2Q2	**9**		
N5	S1	Q1	N5S1Q1	**5**		
N5	S1	Q2	N5S1Q2	**10**		

Figure 79. Server-SNI table with the connection order for SNI ports entered

8. At this point you need to refer to the switch tables you created earlier (and illustrated below). This system has five SPC cards that were installed during manufacturing. When you cable the ports, you proceed from left to right as you see the SPC cards on the switch. Therefore the cable installation order will proceed across the SPC cards in this order:
   a. C3
      1) T1
      2) T2
   b. C4
      1) T1
      2) T2
   c. C7
      1) T1
      2) T2
   d. C11
      1) T1
      2) T2
   e. C15
      1) T1
      2) T2

Switch number	Switch chip 5 (slots 3 and 4)		Switch chip 7 (slots 7 and 8)		Switch chip 6 (slots 11 and 12)		Switch chip 4 (slots 15 and 16)	
1	**Port location**	**CO**	**Port location**	**CO**	**Port location**	**CO**	**Port location**	**CO**
Odd numbered NSB slots	S1C3T1	**1**	S1C7T1	**5**	S1C11T1	**7**	S1C15T1	**9**
	S1C3T2	**2**	S1C7T2	**6**	S1C11T2	**8**	S1C15T2	**10**
Even numbered NSB slots	S1C4T1	**3**		NA		NA		NA
	S1C4T2	**4**		NA		NA		NA

9. Combine the connection order listed in the switch table with the connection order listed in the server-SNI table and enter the switch port locations into the server-SNI table, Figure 80 on page 406 illustrates the almost complete server-SNI table

Note: All of the corresponding switch port locations shown in this table are associated with a non-paired switch (switch number 1). Because of that, all switch port addresses begin with S1. Refer to Table 103 for examples of SNI links connected to paired switches.

Server number (N)	SNI location (S1 to S4)	SNI port number (Q1 or Q2)	SNI link address (N_S_Q)	Connection order	Corresponding switch port location	Switch cable serial number
N1	S1	Q1	N1S1Q1	1	**S1C3T1**	
N1	S1	Q2	N1S1Q2	6	**S1C7T2**	
N1	S2	Q1	N1S2Q1	2	**S1C3T2**	
N1	S2	Q2	N1S2Q2	7	**S1C11T1**	
N1	S3	Q1	N1S3Q1	3	**S1C4T1**	
N1	S3	Q2	N1S3Q2	8	**S1C11T2**	
N2	S1	Q1	N2S1Q1	4	**S1C4T2**	
N2	S1	Q2	N2S1Q2	9	**S1C15T1**	
N3	S2	Q1	N3S2Q1	5	**S1C7T1**	
N3	S2	Q2	N3S2Q2	10	**S1C15T2**	

Figure 80. Server-SNI table with switch ports assigned to SNI ports

10. Assign a switch cable serial number for each set of port locations and SNI external links
11. The server-SNI table is now complete

    Note: A similar system is described and illustrated in "Non-paired switch" on page 407.
12. Transfer the cable serial numbers to the switch cables and cable each SNI link to the proper switch port

Table 103 builds on the information presented in Table 102 on page 402. This information is not part of the procedure to create a server-SNI table. Table 103 shows the relationship between paired SNI links and the associated switch pair. Note that one member of each paired link connects to switch 1 and the other member of the pair connects to switch 2. In contrast, the SNIs associated with a non-paired switch all connect to the same switch (such as switch 1 in the previous table).

Note: Table 103 is not a procedural table and does not show switch port location addresses. All addresses listed in this table are SNI link addresses. A similar system is described and illustrated in "Paired switches" on page 408.

Table 103. Example of switch connections for paired links

SNI link address (N_S_Q)	Connection order	Switch	SNI link address (N_S_Q)	Connection order	Switch	SNI link address (N_S_Q)	Connection order	Switch
N1S1Q1	1	**1**	N4S1Q1	4	**1**	N7S1Q1	7	**1**
N1S1Q2	1	**2**	N4S1Q2	4	**2**	N7S1Q2	7	**2**
N1S2Q1	9	**1**	N4S2Q1	11	**1**	N7S2Q1	13	**1**
N1S2Q2	9	**2**	N4S2Q2	11	**2**	N7S2Q2	13	**2**
N1S3Q1	14	**1**	N4S3Q1	15	**1**	N7S3Q1	16	**1**
N1S3Q2	14	**2**	N4S3Q2	15	**2**	N7S3Q2	16	**2**
N2S1Q1	2	**1**	N5S1Q1	5	**1**	N8S1Q1	8	**1**

Table 103. Example of switch connections for paired links (continued)

SNI link address (N_S_Q)	Connection order	Switch	SNI link address (N_S_Q)	Connection order	Switch	SNI link address (N_S_Q)	Connection order	Switch
N2S1Q2	2	**2**	N5S1Q2	5	**2**	N8S1Q2	8	**2**
N2S2Q1	10	**1**	N5S2Q1	12	**1**			
N2S2Q2	10	**2**	N5S2Q2	12	**2**			
N3S1Q1	3	**1**	N6S1Q1	6	**1**			
N3S1Q2	3	**2**	N6S1Q2	6	**2**			

Note: This table illustrates the association between paired SNI links and the switch pair connection. Refer to "SNI link connections illustrated" and "Process example: Determining switch port locations for SNI links" on page 412 for additional information on paired links.

SNI link connections illustrated

This section illustrates the connections between external SNI links and the associated switch port. In addition to the illustration, each subsection also has the server-SNI table used to determine the associated connections.

Non-paired switch: This example uses the system configuration described in "Step 4: Create the server-SNI table" on page 396. That system had five p5-575 servers with one, 2-Link SNI installed in each server for a 10 link network. Figure 81 on page 408 shows the server frame and all cable paths. Since this system does not require a full set of Switch Port Connection cards, the unused slots are grayed out. Table 104 lists the association between the SNI link address, the switch port location, and the connection order for both servers.

Note: Refer to:

- "Systems with 1 NSB per network" on page 415 for information on connecting links to a single switch pair
- Table 114 on page 418 for the actual switch port connection order for this system
- "Switch port location table templates" on page 457 for the switch 1 port location table templates

Table 104. SNI to switch port location determination

Server number (N)	SNI location (S1 to S4)	SNI port number (Q1 or Q2)	SNI link address (N_S_Q)	Connection order	Corresponding switch port location	Switch cable serial number
N1	S1	Q1	N1S1Q1	1	S1C3T1	
N1	S1	Q2	N1S1Q2	6	S1C7T2	
N1	S2	Q1	N1S2Q1	2	S1C3T2	
N1	S2	Q2	N1S2Q2	7	S1C11T1	
N1	S3	Q1	N1S3Q1	3	S1C4T1	
N1	S3	Q2	N1S3Q2	8	S1C11T2	
N2	S1	Q1	N2S1Q1	4	S1C4T2	
N2	S1	Q2	N2S1Q2	9	S1C15T1	
N3	S2	Q1	N3S2Q1	5	S1C7T1	
N3	S2	Q2	N3S2Q2	10	S1C15T2	

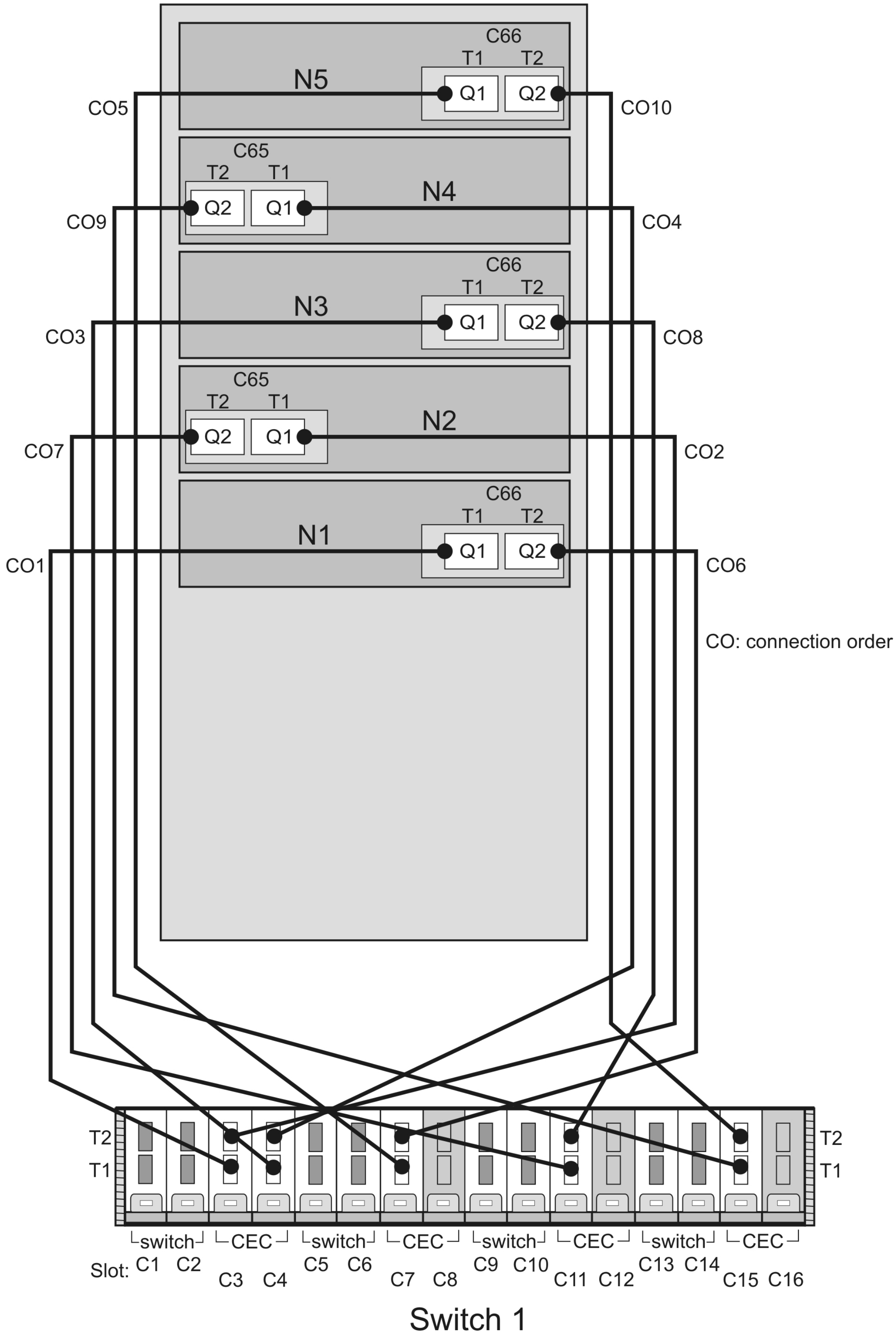


Figure 81. SNI links connected to a non-paired switch

Paired switches: In this example, the system is configured with four p5-595servers with eight 1-Link SNIs each. For clarity, Figure 82 on page 411 only shows one server out of the four servers used in this system. The actual system would have cables attached to all server-to-switch port locations. Table 105 lists the association between the SNI link address, the switch port location, and the connection order for all four servers.

Note: Refer to:

- "Systems with 2 NSBs per network" on page 420 for information on connecting paired links to one switch pair
- Table 125 on page 425 for the actual switch port connection order for this system
- "Switch port location table templates" on page 457 for the switch 1 and switch 2 port location table templates

Table 105. SNI to switch port location determination

Server number (N)	SNI location (S1 to S4)	SNI port number (Q1 or Q2)	SNI link address (N_S_Q)	Connection order	Corresponding switch port location	Switch cable serial number
N1	S1	Q1	N1S1Q1	1	S1C3T1	
N1	S1	Q2	N1S1Q2	1	S2C3T1	
N1	S2	Q1	N1S2Q1	5	S1C7T1	
N1	S2	Q2	N1S2Q2	5	S2C7T1	
N1	S3	Q1	N1S3Q1	9	S1C11T1	
N1	S3	Q2	N1S3Q2	9	S2C11T1	
N1	S4	Q1	N1S4Q1	13	S1C15T1	
N1	S4	Q2	N1S4Q2	13	S2C15T1	
N2	S1	Q1	N2S1Q1	2	S1C3T2	
N2	S1	Q2	N2S1Q2	2	S2C3T2	
N2	S2	Q1	N2S2Q1	6	S1C7T2	
N2	S2	Q2	N2S2Q2	6	S2C7T2	
N2	S3	Q1	N2S3Q1	10	S1C11T2	
N2	S3	Q2	N2S3Q2	10	S2C11T2	
N2	S4	Q1	N2S4Q1	14	S1C15T2	
N2	S4	Q2	N2S4Q2	14	S2C15T2	
N3	S1	Q1	N3S1Q1	3	S1C4T1	
N3	S1	Q2	N3S1Q2	3	S2C4T1	
N3	S2	Q1	N3S2Q1	7	S1C8T1	
N3	S2	Q2	N3S2Q2	7	S2C8T1	
N3	S3	Q1	N3S3Q1	11	S1C12T1	
N3	S3	Q2	N3S3Q2	11	S2C12T1	
N3	S4	Q1	N3S4Q1	15	S1C16T1	
N3	S4	Q2	N3S4Q2	15	S2C16T1	
N4	S1	Q1	N4S1Q1	4	S1C4T2	
N4	S1	Q2	N4S1Q2	4	S2C4T2	
N4	S2	Q1	N4S2Q1	8	S1C8T2	
N4	S2	Q2	N4S2Q2	8	S2C8T2	
N4	S3	Q1	N4S3Q1	12	S1C12T2	

Table 105. SNI to switch port location determination (continued)

Server number (N)	SNI location (S1 to S4)	SNI port number (Q1 or Q2)	SNI link address (N_S_Q)	Connection order	Corresponding switch port location	Switch cable serial number
N4	S3	Q2	N4S3Q2	12	S2C12T2	
N4	S4	Q1	N4S4Q1	16	S1C16T2	
N4	S4	Q2	N4S4Q2	16	S2C16T2	

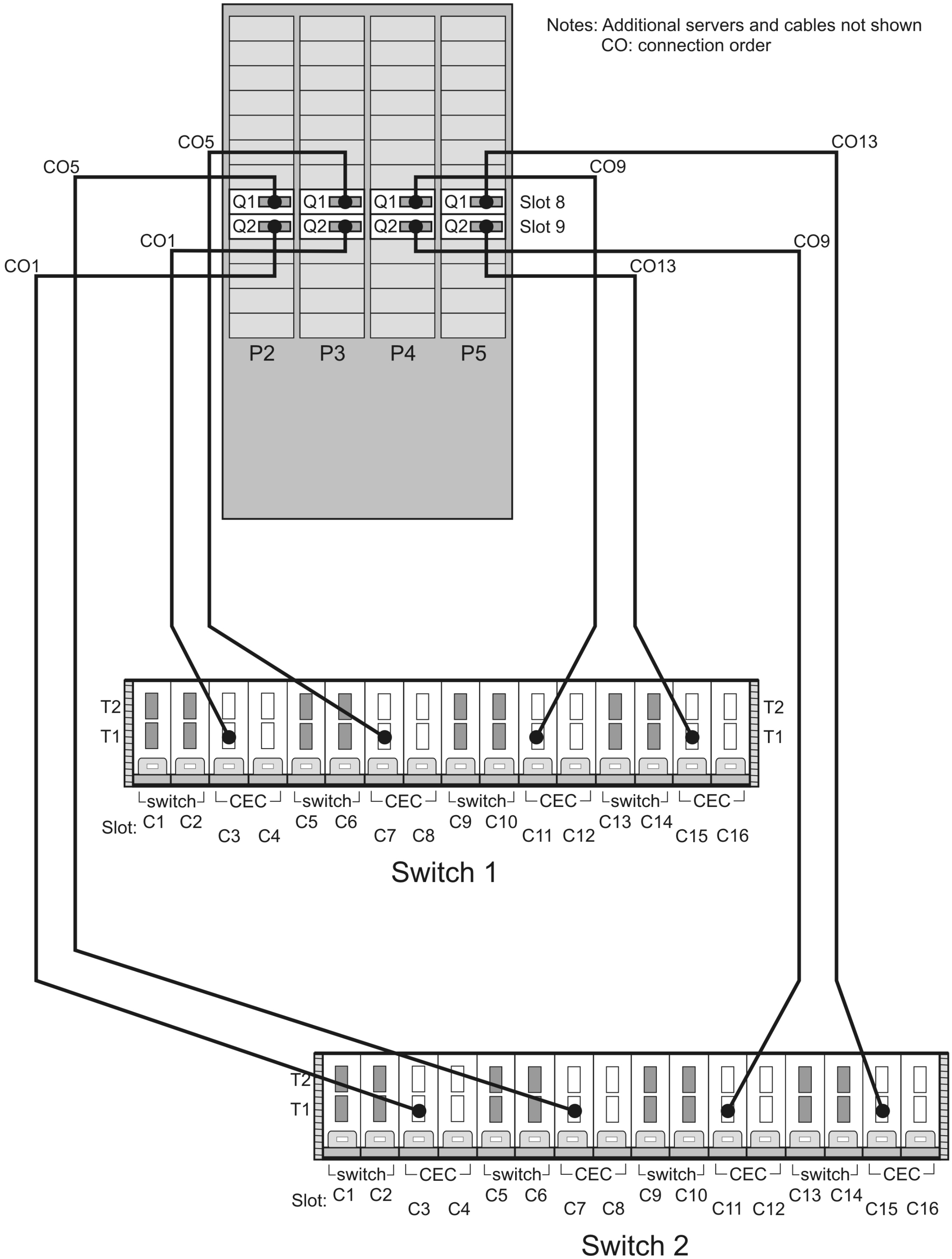


Figure 82. SNI links connected to paired switches

Process example: Determining switch port locations for SNI links

The system used in this example is made up of ten servers in the following order:

1. p5-595 server with eight 1-Link SNIs
2. p5-595 server with eight 1-Link SNIs
3. p5-595 server with eight 1-Link SNIs
4. p5-595 server with eight 1-Link SNIs
5. p5-595 server with two 1-Link SNIs
6. p5-595 server with two 1-Link SNIs
7. p5-595 server with two 1-Link SNIs
8. p5-595 server with two 1-Link SNIs
9. p5-595 server with two 1-Link SNIs
10. p5-595 server with two 1-Link SNIs

Following the link determination procedure:

1. This system has 44 links **on a single network**
2. The system requires three switches configured as ISBs
3. The link groups are determined by the number of links being greater than 32 but less than or equal to 48. Of the three switches, two are paired and the third is non-paired. To determine how many links go to the non-paired switch:
   a. Total number of links – 32 = the number of links on the non-paired switch
      - 44 – 32 = 12 links on the non-paired (third) switch
   b. The first group of 32 links is divided
      - 16 links on switch 1
      - 16 links on switch 2
4. 44 links require 22 Switch Port Connection cards
   - Switch 1 and switch 2 will be fully populated with eight SPC cards in each switch
   - Switch 3 will have six SPC cards installed in slots 3, 7, 11, 15, 4, and 8
5. Complete switch tables
   a. Three switches, switch 1 and 2 are paired, switch 3 is non-paired
   b. Network has 22 SPC cards (44 links)
   c. Refer to “Systems with 3 NSBs per network” on page 425
   d. Follow the instructions at the beginning of that section and enter the connection order for the first switch pair and then for the non-paired switch listed in Table 131 on page 428

Table 106. Example: Link determination, switch 1 switch port locations

Switch number	Switch chip 5 (slots 3 and 4)		Switch chip 7 (slots 7 and 8)		Switch chip 6 (slots 11 and 12)		Switch chip 4 (slots 15 and 16)	
1	Port location	CO	Port location	CO	Port location	CO	Port location	CO
Odd numbered NSB slots	S1C3T1	1	S1C7T1	5	S1C11T1	9	S1C15T1	13
	S1C3T2	2	S1C7T2	6	S1C11T2	10	S1C15T2	14
Even numbered NSB slots	S1C4T1	3	S1C8T1	7	S1C12T1	11	S1C16T1	15
	S1C4T2	4	S1C8T2	8	S1C12T2	12	S1C16T2	16

Table 107. Example: Link determination, switch 2 switch port locations

Switch number	Switch chip 5 (slots 3 and 4)		Switch chip 7 (slots 7 and 8)		Switch chip 6 (slots 11 and 12)		Switch chip 4 (slots 15 and 16)	
2	**Port location**	**CO**	**Port location**	**CO**	**Port location**	**CO**	**Port location**	**CO**
Odd numbered NSB slots	S2C3T1	1	S2C7T1	5	S2C11T1	9	S2C15T1	13
	S2C3T2	2	S2C7T2	6	S2C11T2	10	S2C15T2	14
Even numbered NSB slots	S2C4T1	3	S2C8T1	7	S2C12T1	11	S2C16T1	15
	S2C4T2	4	S2C8T2	8	S2C12T2	12	S2C16T2	16

Table 108. Example: Link determination, switch 3 switch port locations

Switch number	Switch chip 5 (slots 3 and 4)		Switch chip 7 (slots 7 and 8)		Switch chip 6 (slots 11 and 12)		Switch chip 4 (slots 15 and 16)	
3	**Port location**	**CO**	**Port location**	**CO**	**Port location**	**CO**	**Port location**	**CO**
Odd numbered NSB slots	S3C3T1	17	S3C7T1	21	S3C11T1	25	S3C15T1	27
	S3C3T2	18	S3C7T2	22	S3C11T2	26	S3C15T2	28
Even numbered NSB slots	S3C4T1	19	S3C8T1	23		NA		NA
	S3C4T2	20	S3C8T2	24		NA		NA
Note: Switch Port Connection cards are not installed in slots 12 and 16 of switch 3.								

6. Complete the server-SNI table by matching the connection order numbers and associating the odd Q number with an odd numbered switch whenever possible

Table 109. Example: Link determination, server-SNI to switch port location table

Server number (N)	SNI location (S1 to S4)	SNI port number (Q1 or Q2)	SNI link address (N_S_Q)	Connection order	Port location	Switch cable serial number
N1	S1	Q1	N1S1Q1	1	S1C3T1	Customer assigned
N1	S1	Q2	N1S1Q2	1	S2C3T1	Customer assigned
N1	S2	Q1	N1S2Q1	11	S1C12T1	Customer assigned
N1	S2	Q2	N1S2Q2	11	S2C12T1	Customer assigned
N1	S3	Q1	N1S3Q1	15	S1C16T1	Customer assigned
N1	S3	Q2	N1S3Q2	15	S2C16T1	Customer assigned
N1	S4	Q1	N1S4Q1	19	S3C4T1	Customer assigned
N1	S4	Q2	N1S4Q2	23	S3C8T1	Customer assigned
N2	S1	Q1	N2S1Q1	2	S1C3T2	Customer assigned

Table 109. Example: Link determination, server-SNI to switch port location table (continued)

Server number (N)	SNI location (S1 to S4)	SNI port number (Q1 or Q2)	SNI link address (N_S_Q)	Connection order	Port location	Switch cable serial number
N2	S1	Q2	N2S1Q2	2	S2C3T2	Customer assigned
N2	S2	Q1	N2S2Q1	12	S1C12T2	Customer assigned
N2	S2	Q2	N2S2Q2	12	S2C12T2	Customer assigned
N2	S3	Q1	N2S3Q1	16	S1C16T2	Customer assigned
N2	S3	Q2	N2S3Q2	16	S2C16T2	Customer assigned
N2	S4	Q1	N2S4Q1	20	S3C4T2	Customer assigned
N2	S4	Q2	N2S4Q2	24	S3C8T2	Customer assigned
N3	S1	Q1	N3S1Q1	3	S1C4T1	Customer assigned
N3	S1	Q2	N3S1Q2	3	S2C4T1	Customer assigned
N3	S2	Q1	N3S2Q1	13	S1C15T1	Customer assigned
N3	S2	Q2	N3S2Q2	13	S2C15T1	Customer assigned
N3	S3	Q1	N3S3Q1	17	S3C3T1	Customer assigned
N3	S3	Q2	N3S3Q2	21	S3C7T1	Customer assigned
N3	S4	Q1	N3S4Q1	25	S3C11T1	Customer assigned
N3	S4	Q2	N3S4Q2	27	S3C15T1	Customer assigned
N4	S1	Q1	N4S1Q1	4	S1C4T2	Customer assigned
N4	S1	Q2	N4S1Q2	4	S2C4T2	Customer assigned
N4	S2	Q1	N4S2Q1	14	S1C15T2	Customer assigned
N4	S2	Q2	N4S2Q2	14	S2C15T2	Customer assigned
N4	S3	Q1	N4S3Q1	18	S3C3T2	Customer assigned
N4	S3	Q2	N4S3Q2	22	S3C7T2	Customer assigned
N4	S4	Q1	N4S4Q1	26	S3C11T2	Customer assigned

Table 109. Example: Link determination, server-SNI to switch port location table (continued)

Server number (N)	SNI location (S1 to S4)	SNI port number (Q1 or Q2)	SNI link address (N_S_Q)	Connection order	Port location	Switch cable serial number
N4	S4	Q2	N4S4Q2	28	S3C15T2	Customer assigned
N5	S1	Q1	N5S1Q1	5	S1C7T1	Customer assigned
N5	S1	Q2	N5S1Q2	5	S2C7T1	Customer assigned
N6	S1	Q1	N6S1Q1	6	S1C7T2	Customer assigned
N6	S1	Q2	N6S1Q2	6	S2C7T2	Customer assigned
N7	S1	Q1	N7S1Q1	7	S1C8T1	Customer assigned
N7	S1	Q2	N7S1Q2	7	S2C8T1	Customer assigned
N8	S1	Q1	N8S1Q1	8	S1C8T2	Customer assigned
N8	S1	Q2	N8S1Q2	8	S2C8T2	Customer assigned
N9	S1	Q1	N9S1Q1	9	S1C11T1	Customer assigned
N9	S1	Q2	N9S1Q2	9	S2C11T1	Customer assigned
N10	S1	Q1	N10S1Q1	10	S1C11T2	Customer assigned
N10	S1	Q2	N10S1Q2	10	S2C11T2	Customer assigned

Reference tables and templates

Switch port connection order tables

Refer to the section listing the same number of switches as configured in your system. Each of these sections have tables that reference specific configurations based on the number of links in the system.

- “Systems with 1 NSB per network”
- “Systems with 2 NSBs per network” on page 420
- “Systems with 3 NSBs per network” on page 425
- “Systems with 4 NSBs per network” on page 430
- “Systems with 5 NSBs per network (single network configurations only)” on page 435
- “Systems with 6 NSBs per network (single network configurations only)” on page 439
- “Systems with 7 NSBs per network (single network configurations only)” on page 445
- “Systems with 8 NSBs per network (single network configurations only)” on page 449
- “Dual network systems with 16 NSBs” on page 454

Systems with 1 NSB per network: The tables in this section list the connection order for:
- A single network system with 1 NSB

- Supports up to 16 links per system
- A dual network system with 2 NSBs
  - 1 NSB per network supporting up to 16 links per network
  - Supports up to 32 links per system

Note: When you add links to a system, you must do so with pairs of links. Because of that, all systems must have an even number of links. However, when you add a link pair to a dual network system, you must split the pair and add one link to each network. Therefore, a dual network system may have an odd number of links per network, but the total system will have an even number of links.

Switches in these configurations will have between one and eight server-to-switch, SPC cards installed. If your system requires more than eight server-to-switch, SPC cards, additional switches must be added. All switches in a network having 1 NSB per network will have one of the following configurations:

- A single network system with 2 links or a dual network system with 1 or 2 links per network:
  - One Switch Port Connection card per network
  - Refer to Table 110
- A single network system with 4 links or a dual network system with 3 or 4 links per network:
  - Two Switch Port Connection cards per network
  - Refer to Table 111 on page 417
- A single network system with 6 links or a dual network system with 5 or 6 links per network:
  - Three Switch Port Connection cards per network
  - Refer to Table 112 on page 417
- A single network system with 8 links or a dual network system with 7 or 8 links per network:
  - Four Switch Port Connection cards per network
  - Refer to Table 113 on page 417
- A single network system with 10 links or a dual network system with 9 or 10 links per network:
  - Five Switch Port Connection cards per network
  - Refer to Table 114 on page 418
- A single network system with 12 links or a dual network system with 11 or 12 links per network:
  - Six Switch Port Connection cards per network
  - Refer to Table 115 on page 418
- A single network system with 14 links or a dual network system with 13 or 14 links per network:
  - Seven Switch Port Connection cards per network
  - Refer to Table 116 on page 419
- A single network system with 16 links or a dual network system with 15 or 16 links per network:
  - Eight Switch Port Connection cards per network
  - Refer to Table 117 on page 419

Table 110. Cable installation order for systems with 1 NSB per network and one Switch Port Connection card per network

Switch port connection order	
Switch 1	**CO**
S1C3T1	1
S1C3T2	2
Note: CO: connection order	

Table 111. Cable installation order for systems with 1 NSB per network and two Switch Port Connection cards per network

Switch port connection order	
Switch 1	**CO**
S1C3T1	1
S1C3T2	2
S1C7T1	3
S1C7T2	4
Note: CO: connection order	

Table 112. Cable installation order for systems with 1 NSB per network and three Switch Port Connection cards per network

Switch port connection order	
Switch 1	**CO**
S1C3T1	1
S1C3T2	2
S1C7T1	3
S1C7T2	4
S1C11T1	5
S1C11T2	6
Note: CO: connection order	

Table 113. Cable installation order for systems with 1 NSB per network and four Switch Port Connection cards per network

Switch port connection order	
Switch 1	**CO**
S1C3T1	1
S1C3T2	2
S1C7T1	3
S1C7T2	4
S1C11T1	5
S1C11T2	6

Table 113. Cable installation order for systems with 1 NSB per network and four Switch Port Connection cards per network (continued)

Switch port connection order	
Switch 1	**CO**
S1C15T1	7
S1C15T2	8
Note: CO: connection order	

Table 114. Cable installation order for systems with 1 NSB per network and five Switch Port Connection cards per network

Switch port connection order	
Switch 1	**CO**
S1C3T1	1
S1C3T2	2
S1C4T1	3
S1C4T2	4
S1C7T1	5
S1C7T2	6
S1C11T1	7
S1C11T2	8
S1C15T1	9
S1C15T2	10
Note: CO: connection order	

Table 115. Cable installation order for systems with 1 NSB per network and six Switch Port Connection cards per network

Switch port connection order	
Switch 1	**CO**
S1C3T1	1
S1C3T2	2
S1C4T1	3
S1C4T2	4
S1C7T1	5
S1C7T2	6
S1C8T1	7
S1C8T2	8
S1C11T1	9
S1C11T2	10

Table 115. Cable installation order for systems with 1 NSB per network and six Switch Port Connection cards per network (continued)

Switch port connection order	
Switch 1	**CO**
S1C15T1	11
S1C15T2	12
Note: CO: connection order	

Table 116. Cable installation order for systems with 1 NSB per network and seven Switch Port Connection cards per network

Switch port connection order	
Switch 1	**CO**
S1C3T1	1
S1C3T2	2
S1C4T1	3
S1C4T2	4
S1C7T1	5
S1C7T2	6
S1C8T1	7
S1C8T2	8
S1C11T1	9
S1C11T2	10
S1C12T1	11
S1C12T2	12
S1C15T1	13
S1C15T2	14
Note: CO: connection order	

Table 117. Cable installation order for systems with 1 NSB per network and eight Switch Port Connection cards per network (fully populated)

Switch port connection order	
Switch 1	**CO**
S1C3T1	1
S1C3T2	2
S1C4T1	3
S1C4T2	4
S1C7T1	5
S1C7T2	6
S1C8T1	7

Table 117. Cable installation order for systems with 1 NSB per network and eight Switch Port Connection cards per network (fully populated) (continued)

Switch port connection order	
Switch 1	**CO**
S1C8T2	8
S1C11T1	9
S1C11T2	10
S1C12T1	11
S1C12T2	12
S1C15T1	13
S1C15T2	14
S1C16T1	15
S1C16T2	16
Note: CO: connection order	

Systems with 2 NSBs per network: The tables in this section list the connection order for:

- A single network system with 2 NSBs
  - Supports up to 32 links per system
- A dual network system with 4 NSBs
  - 2 NSBs per network supporting up to 32 links per network
  - Supports up to 64 links per system

Note: When you add links to a system, you must do so with pairs of links. Because of that, all systems must have an even number of links. However, when you add a link pair to a dual network system, you must split the pair and add one link to each network. Therefore, a dual network system may have an odd number of links per network, but the system will have an even number of links.

A system with 9 to 16 server-to-switch, Switch Port Connection cards (18 to 32 links) per network, requires two switches on each network for server-to-switch communication. With 2 NSBs per network, your system will have one of the following connection order configurations:

- A single network system with 18 links or a dual network system with 17 or 18 links per network:
  - Nine SPC cards per network
  - Five SPC cards in switch 1 and four SPC cards in switch 2 **(2 NSB, 5 and 4 configuration)**
  - Refer to Table 118 on page 421
- A single network system with 20 links or a dual network system with 19 or 20 links per network:
  - Ten SPC cards per network
  - Five SPC cards in switch 1 and five SPC cards in switch 2 **(2 NSB, 5 and 5 configuration)**
  - Refer to Table 119 on page 421
- A single network system with 22 links or a dual network system with 21 or 22 links per network:
  - Eleven SPC cards per network
  - Six SPC cards in switch 1 and five SPC cards in switch 2 **(2 NSB, 6 and 5 configuration)**
  - Refer to Table 120 on page 422
- A single network system with 24 links or a dual network system with 23 or 24 links per network:
  - Twelve SPC cards per network
  - Six SPC cards in switch 1 and six SPC cards in switch 2 **(2 NSB, 6 and 6 configuration)**
  - Refer to Table 121 on page 423
- A single network system with 26 links or a dual network system with 25 or 26 links per network:
  - Thirteen SPC cards per network
  - Seven SPC cards in switch 1 and six SPC cards in switch 2 **(2 NSB, 7 and 6 configuration)**

– Refer to Table 122 on page 423

- A single network system with 28 links or a dual network system with 27 or 28 links per network:
  – Fourteen SPC cards per network
  – Seven SPC cards in switch 1 and seven SPC cards in switch 2 **(2 NSB, 7 and 7 configuration)**
  – Refer to Table 123 on page 424
- A single network system with 30 links or a dual network system with 29 or 30 links per network:
  – Fifteen SPC cards per network
  – Eight SPC cards in switch 1 and seven SPC cards in switch 2 **(2 NSB, 8 and 7 configuration)**
  – Refer to Table 124 on page 424
- A single network system with 32 links or a dual network system with 31 or 32 links per network:
  – Sixteen SPC cards per network
  – Eight SPC cards in switch 1 and eight SPC cards in switch 2 **(2 NSB, 8 and 8 configuration)**
  – Refer to Table 125 on page 425

Remember: The manufacturing installation order is different than the cable installation order. Therefore, as the number of Switch Port Connection cards installed changes, the connection order for some links will also change.

Table 118. Cable installation order for systems with 18 links per network using the 5 and 4 configuration for Switch Port Connection cards

Switch port connection order		
Switch 1	**Switch 2**	**CO**
S1C3T1	S2C3T1	1
S1C3T2	S2C3T2	2
S1C4T1	NA	3
S1C4T2	NA	4
S1C7T1	S2C7T1	5
S1C7T2	S2C7T2	6
S1C11T1	S2C11T1	7
S1C11T2	S2C11T2	8
S1C15T1	S2C15T1	9
S1C15T2	S2C15T2	10
Note: CO: connection order		

Table 119. Cable installation order for systems with 20 links per network using the 5 and 5 configuration for Switch Port Connection cards

Switch port connection order		
Switch 1	**Switch 2**	**CO**
S1C3T1	S2C3T1	1
S1C3T2	S2C3T2	2
S1C4T1	S2C4T1	3

Table 119. Cable installation order for systems with 20 links per network using the 5 and 5 configuration for Switch Port Connection cards (continued)

Switch port connection order		
Switch 1	**Switch 2**	**CO**
S1C4T2	S2C4T2	4
S1C7T1	S2C7T1	5
S1C7T2	S2C7T2	6
S1C11T1	S2C11T1	7
S1C11T2	S2C11T2	8
S1C15T1	S2C15T1	9
S1C15T2	S2C15T2	10
Note: CO: connection order		

Table 120. Cable installation order for systems with 22 links per network using the 6 and 5 configuration for Switch Port Connection cards

Switch port connection order		
Switch 1	**Switch 2**	**CO**
S1C3T1	S2C3T1	1
S1C3T2	S2C3T2	2
S1C4T1	S2C4T1	3
S1C4T2	S2C4T2	4
S1C7T1	S2C7T1	5
S1C7T2	S2C7T2	6
S1C8T1	NA	7
S1C8T2	NA	8
S1C11T1	S2C11T1	9
S1C11T2	S2C11T2	10
S1C15T1	S2C15T1	11
S1C15T2	S2C15T2	12
Note: CO: connection order		

Table 121. Cable installation order for systems with 24 links per network using the 6 and 6 configuration for Switch Port Connection cards

Switch port connection order		
Switch 1	**Switch 2**	**CO**
S1C3T1	S2C3T1	1
S1C3T2	S2C3T2	2
S1C4T1	S2C4T1	3
S1C4T2	S2C4T2	4
S1C7T1	S2C7T1	5
S1C7T2	S2C7T2	6
S1C8T1	S2C8T1	7
S1C8T2	S2C8T2	8
S1C11T1	S2C11T1	9
S1C11T2	S2C11T2	10
S1C15T1	S2C15T1	11
S1C15T2	S2C15T2	12
Note: CO: connection order		

Table 122. Cable installation order for systems with 26 links per network using the 7 and 6 configuration for Switch Port Connection cards

Switch port connection order		
Switch 1	**Switch 2**	**CO**
S1C3T1	S2C3T1	1
S1C3T2	S2C3T2	2
S1C4T1	S2C4T1	3
S1C4T2	S2C4T2	4
S1C7T1	S2C7T1	5
S1C7T2	S2C7T2	6
S1C8T1	S2C8T1	7
S1C8T2	S2C8T2	8
S1C11T1	S2C11T1	9
S1C11T2	S2C11T2	10
S1C12T1	NA	11
S1C12T2	NA	12
S1C15T1	S2C15T1	13
S1C15T2	S2C15T2	14

Table 122. Cable installation order for systems with 26 links per network using the 7 and 6 configuration for Switch Port Connection cards (continued)

Switch port connection order		
Switch 1	**Switch 2**	**CO**
Note: CO: connection order		

Table 123. Cable installation order for systems with 28 links per network using the 7 and 7 configuration for Switch Port Connection cards

Switch port connection order		
Switch 1	**Switch 2**	**CO**
S1C3T1	S2C3T1	1
S1C3T2	S2C3T2	2
S1C4T1	S2C4T1	3
S1C4T2	S2C4T2	4
S1C7T1	S2C7T1	5
S1C7T2	S2C7T2	6
S1C8T1	S2C8T1	7
S1C8T2	S2C8T2	8
S1C11T1	S2C11T1	9
S1C11T2	S2C11T2	10
S1C12T1	S2C12T1	11
S1C12T2	S2C12T2	12
S1C15T1	S2C15T1	13
S1C15T2	S2C15T2	14
Note: CO: connection order		

Table 124. Cable installation order for systems with 30 links per network using the 8 and 7 configuration for Switch Port Connection cards

Switch port connection order		
Switch 1	**Switch 2**	**CO**
S1C3T1	S2C3T1	1
S1C3T2	S2C3T2	2
S1C4T1	S2C4T1	3
S1C4T2	S2C4T2	4
S1C7T1	S2C7T1	5
S1C7T2	S2C7T2	6
S1C8T1	S2C8T1	7
S1C8T2	S2C8T2	8
S1C11T1	S2C11T1	9
S1C11T2	S2C11T2	10
S1C12T1	S2C12T1	11

Table 124. Cable installation order for systems with 30 links per network using the 8 and 7 configuration for Switch Port Connection cards (continued)

Switch port connection order		
Switch 1	**Switch 2**	**CO**
S1C12T2	S2C12T2	12
S1C15T1	S2C15T1	13
S1C15T2	S2C15T2	14
S1C16T1	NA	15
S1C16T2	NA	16
Note: CO: connection order		

Table 125. Cable installation order for systems with 32 links per network using the 8 and 8 configuration for Switch Port Connection cards

Switch port connection order		
Switch 1	**Switch 2**	**CO**
S1C3T1	S2C3T1	1
S1C3T2	S2C3T2	2
S1C4T1	S2C4T1	3
S1C4T2	S2C4T2	4
S1C7T1	S2C7T1	5
S1C7T2	S2C7T2	6
S1C8T1	S2C8T1	7
S1C8T2	S2C8T2	8
S1C11T1	S2C11T1	9
S1C11T2	S2C11T2	10
S1C12T1	S2C12T1	11
S1C12T2	S2C12T2	12
S1C15T1	S2C15T1	13
S1C15T2	S2C15T2	14
S1C16T1	S2C16T1	15
S1C16T2	S2C16T2	16
Note: CO: connection order		

Systems with 3 NSBs per network: The tables in this section list the connection order for:

- A single network system with 3 NSBs
  - Supports up to 48 links per system
- A dual network system with 6 NSBs (three per network)
  - 3 NSBs per network supporting up to 48 links per network
  - Supports up to 96 links per system

Note: When you add links to a system, you must do so with pairs of links. Because of that, all systems must have an even number of links. However, when you add a link pair to a dual network system, you must split the pair and add one link to each network. Therefore, a dual network system may have an odd number of links per network, but the total system will have an even number of links.

A system with 17 to 24 server-to-switch, Switch Port Connection cards (34 to 48 links) per network requires three NSB configured switches per network. A system with three NSBs per network will have two fully populated switches and a partially populated switch on each network. The two fully populated switches are the first to get cabled and the connection order for those switches is the same as what is listed in Table 125 on page 425. You must use that table to cable the first two switches on each network.

The connection order for the third switch on each network is dependent on the number of server-to-switch, SPC cards installed in that switch. Using the number of SPC cards (or links) in your system, choose the appropriate table for the third switch on the network. For systems with:

- A single network system with 34 links or a dual network system with 33 or 34 links per network:
  - Seventeen SPC cards per network
  - One SPC card in switch 3 (each network)
  - Refer to Table 126
- A single network system with 36 links or a dual network system with 35 or 36 links per network:
  - Eighteen SPC cards per network
  - Two SPC cards in switch 3 (each network)
  - Refer to Table 127 on page 427
- A single network system with 38 links or a dual network system with 37 or 38 links per network:
  - Nineteen SPC cards per network
  - Three SPC cards in switch 3 (each network)
  - Refer to Table 128 on page 427
- A single network system with 40 links or a dual network system with 39 or 40 links per network:
  - Twenty SPC cards per network
  - Four SPC cards in switch 3 (each network)
  - Refer to Table 129 on page 427
- A single network system with 42 links or a dual network system with 41 or 42 links per network:
  - Twenty-one SPC cards per network
  - Five SPC cards in switch 3 (each network)
  - Refer to Table 130 on page 428
- A single network system with 44 links or a dual network system with 43 or 44 links per network:
  - Twenty-two SPC cards per network
  - Six SPC cards in switch 3 (each network)
  - Refer to Table 131 on page 428
- A single network system with 46 links or a dual network system with 45 or 46 links per network:
  - Twenty-three SPC cards per network
  - Seven SPC cards in switch 3 (each network)
  - Refer to Table 132 on page 429
- A single network system with 48 links or a dual network system with 47 or 48 links per network:
  - Twenty-four SPC cards per network
  - Eight SPC cards in switch 3 (each network)
  - Refer to Table 133 on page 429

Table 126. Cable installation order for switch 3 with one Switch Port Connection card

Switch port connection order	
Switch 3	**CO**
S3C3T1	17
S3C3T2	18
Note: CO: connection order	

Table 127. Cable installation order for switch 3 with two Switch Port Connection cards

Switch port connection order	
Switch 3	**CO**
S3C3T1	17
S3C3T2	18
S3C7T1	19
S3C7T2	20
Note: CO: connection order	

Table 128. Cable installation order for switch 3 with three Switch Port Connection cards

Switch port connection order	
Switch 3	**CO**
S3C3T1	17
S3C3T2	18
S3C7T1	19
S3C7T2	20
S3C11T1	21
S3C11T2	22
Note: CO: connection order	

Table 129. Cable installation order for switch 3 with four Switch Port Connection cards

Switch port connection order	
Switch 3	**CO**
S3C3T1	17
S3C3T2	18
S3C7T1	19
S3C7T2	20
S3C11T1	21
S3C11T2	22
S3C15T1	23

Table 129. Cable installation order for switch 3 with four Switch Port Connection cards (continued)

Switch port connection order	
Switch 3	**CO**
S3C15T2	24
Note: CO: connection order	

Table 130. Cable installation order for switch 3 with five Switch Port Connection cards

Switch port connection order	
Switch 3	**CO**
S3C3T1	17
S3C3T2	18
S3C4T1	19
S3C4T2	20
S3C7T1	21
S3C7T2	22
S3C11T1	23
S3C11T2	24
S3C15T1	25
S3C15T2	26
Note: CO: connection order	

Table 131. Cable installation order for switch 3 with six Switch Port Connection cards

Switch port connection order	
Switch 3	**CO**
S3C3T1	17
S3C3T2	18
S3C4T1	19
S3C4T2	20
S3C7T1	21
S3C7T2	22
S3C8T1	23
S3C8T2	24
S3C11T1	25
S3C11T2	26
S3C15T1	27
S3C15T2	28

Table 131. Cable installation order for switch 3 with six Switch Port Connection cards (continued)

Switch port connection order	
Switch 3	**CO**
Note: CO: connection order	

Table 132. Cable installation order for switch 3 with seven Switch Port Connection cards

Switch port connection order	
Switch 3	**CO**
S3C3T1	17
S3C3T2	18
S3C4T1	19
S3C4T2	20
S3C7T1	21
S3C7T2	22
S3C8T1	23
S3C8T2	24
S3C11T1	25
S3C11T2	26
S3C12T1	27
S3C12T2	28
S3C15T1	29
S3C15T2	30
Note: CO: connection order	

Table 133. Cable installation order for switch 3 with eight Switch Port Connection cards (fully populated)

Switch port connection order	
Switch 3	**CO**
S3C3T1	17
S3C3T2	18
S3C4T1	19
S3C4T2	20
S3C7T1	21
S3C7T2	22
S3C8T1	23
S3C8T2	24
S3C11T1	25
S3C11T2	26
S3C12T1	27
S3C12T2	28
S3C15T1	29

Table 133. Cable installation order for switch 3 with eight Switch Port Connection cards (fully populated) (continued)

Switch port connection order	
Switch 3	**CO**
S3C15T2	30
S3C16T1	31
S3C16T2	32
Note: CO: connection order	

Systems with 4 NSBs per network: The tables in this section list the connection order for:

- A single network system with 4 NSBs
  - Supports up to 64 links per system
  - Requires two ISB configured switches
- A dual network system with 8 NSBs (four per network)
  - 4 NSBs per network supporting up to 64 links per network
  - Supports up to 128 links per system
  - Requires four ISB configured switches (two per network)

  Note: When you add links to a system, you must do so with pairs of links. Because of that, all systems must have an even number of links. However, when you add a link pair to a dual network system, you must split the pair and add one link to each network. Therefore, a dual network system may have an odd number of links per network, but the total system will have an even number of links.

A system with 25 to 32 server-to-switch, Switch Port Connection cards (50 to 64 links) per network requires four NSB configured switches per network. A system with four NSBs per network will have two fully populated switches and an additional pair of switches that may be partially populated on each network. The two fully populated switches are the first to get cabled and the connection order for those switches is the same as what is listed in Table 125 on page 425. You must use that table to cable the first two switches on each network.

The connection order for the second switch pair on each network is dependent on the number of server-to-switch, SPC cards installed in those switches. Using the number of SPC cards (or links) in your system, choose the appropriate table for the third and fourth switch on the network. For systems with:

- A single network system with 50 links or a dual network system with 49 or 50 links per network:
  - Twenty-five SPC cards per network
  - Five SPC cards in switch 3 and four SPC cards in switch 4 **(4 NSB, 5 and 4 configuration)**
  - Refer to Table 134 on page 431
- A single network system with 52 links or a dual network system with 51 or 52 links per network:
  - Twenty-six SPC cards per network
  - Five SPC cards in switch 3 and five SPC cards in switch 4 **(4 NSB, 5 and 5 configuration)**
  - Refer to Table 135 on page 431
- A single network system with 54 links or a dual network system with 53 or 54 links per network:
  - Twenty-seven SPC cards per network
  - Six SPC cards in switch 3 and five SPC cards in switch 4 **(4 NSB, 6 and 5 configuration)**
  - Refer to Table 136 on page 432
- A single network system with 56 links or a dual network system with 55 or 56 links per network:
  - Twenty-eight SPC cards per network
  - Six SPC cards in switch 3 and six SPC cards in switch 4 **(4 NSB, 6 and 6 configuration)**
  - Refer to Table 137 on page 432
- A single network system with 58 links or a dual network system with 57 or 58 links per network:
  - Twenty-nine SPC cards per network
  - Seven SPC cards in switch 3 and six SPC cards in switch 4 **(4 NSB, 7 and 6 configuration)**

– Refer to Table 138 on page 433
- A single network system with 60 links or a dual network system with 59 or 60 links per network:
  – Thirty SPC cards per network
  – Seven SPC cards in switch 3 and seven SPC cards in switch 4 **(4 NSB, 7 and 7 configuration)**
  – Refer to Table 139 on page 434
- A single network system with 62 links or a dual network system with 61 or 62 links per network:
  – Thirty-one SPC cards per network
  – Eight SPC cards in switch 3 and seven SPC cards in switch 4 **(4 NSB, 8 and 7 configuration)**
  – Refer to Table 140 on page 434
- A single network system with 64 links or a dual network system with 63 or 64 links per network:
  – Thirty-two SPC cards per network
  – Eight SPC cards in switch 3 and eight SPC cards in switch 4 **(4 NSB, 8 and 8 configuration)**
  – Refer to Table 141 on page 435

Note: These tables do not include the switch port connections for the ISBs required in this configuration.

Table 134. Cable installation order for systems with 50 links per network using the 5 and 4 configuration for Switch Port Connection cards

Switch port connection order		
Switch 3	**Switch 4**	**CO**
S3C3T1	S4C3T1	17
S3C3T2	S4C3T2	18
S3C4T1	NA	19
S3C4T2	NA	20
S3C7T1	S4C7T1	21
S3C7T2	S4C7T2	22
S3C11T1	S4C11T1	23
S3C11T2	S4C11T2	24
S3C15T1	S4C15T1	25
S3C15T2	S4C15T2	26

Table 135. Cable installation order for systems with 52 links per network using the 5 and 5 configuration for Switch Port Connection cards

Switch port connection order		
Switch 3	**Switch 4**	**CO**
S3C3T1	S4C3T1	17
S3C3T2	S4C3T2	18
S3C4T1	S4C4T1	19
S3C4T2	S4C4T2	20
S3C7T1	S4C7T1	21

Table 135. Cable installation order for systems with 52 links per network using the 5 and 5 configuration for Switch Port Connection cards (continued)

Switch port connection order		
Switch 3	**Switch 4**	**CO**
S3C7T2	S4C7T2	22
S3C11T1	S4C11T1	23
S3C11T2	S4C11T2	24
S3C15T1	S4C15T1	25
S3C15T2	S4C15T2	26

Table 136. Cable installation order for systems with 54 links per network using the 6 and 5 configuration for Switch Port Connection cards

Switch port connection order		
Switch 3	**Switch 4**	**CO**
S3C3T1	S4C3T1	17
S3C3T2	S4C3T2	18
S3C4T1	S4C4T1	19
S3C4T2	S4C4T2	20
S3C7T1	S4C7T1	21
S3C7T2	S4C7T2	22
S3C8T1	NA	23
S3C8T2	NA	24
S3C11T1	S4C11T1	25
S3C11T2	S4C11T2	26
S3C15T1	S4C15T1	27
S3C15T2	S4C15T2	28

Table 137. Cable installation order for systems with 56 links per network using the 6 and 6 configuration for Switch Port Connection cards

Switch port connection order		
Switch 3	**Switch 4**	**CO**
S3C3T1	S4C3T1	17
S3C3T2	S4C3T2	18

Table 137. Cable installation order for systems with 56 links per network using the 6 and 6 configuration for Switch Port Connection cards (continued)

Switch port connection order		
Switch 3	**Switch 4**	**CO**
S3C4T1	S4C4T1	19
S3C4T2	S4C4T2	20
S3C7T1	S4C7T1	21
S3C7T2	S4C7T2	22
S3C8T1	S4C8T1	23
S3C8T2	S4C8T2	24
S3C11T1	S4C11T1	25
S3C11T2	S4C11T2	26
S3C15T1	S4C15T1	27
S3C15T2	S4C15T2	28

Table 138. Cable installation order for systems with 58 links per network using the 7 and 6 configuration for Switch Port Connection cards

Switch port connection order		
Switch 3	**Switch 4**	**CO**
S3C3T1	S4C3T1	17
S3C3T2	S4C3T2	18
S3C4T1	S4C4T1	19
S3C4T2	S4C4T2	20
S3C7T1	S4C7T1	21
S3C7T2	S4C7T2	22
S3C8T1	S4C8T1	23
S3C8T2	S4C8T2	24
S3C11T1	S4C11T1	25
S3C11T2	S4C11T2	26
S3C12T1	NA	27
S3C12T2	NA	28
S3C15T1	S4C15T1	29
S3C15T2	S4C15T2	30

Table 139. Cable installation order for systems with 60 links per network using the 7 and 7 configuration for Switch Port Connection cards

Switch port connection order		
Switch 3	**Switch 4**	**CO**
S3C3T1	S4C3T1	17
S3C3T2	S4C3T2	18
S3C4T1	S4C4T1	19
S3C4T2	S4C4T2	20
S3C7T1	S4C7T1	21
S3C7T2	S4C7T2	22
S3C8T1	S4C8T1	23
S3C8T2	S4C8T2	24
S3C11T1	S4C11T1	25
S3C11T2	S4C11T2	26
S3C12T1	S4C12T1	27
S3C12T2	S4C12T2	28
S3C15T1	S4C15T1	29
S3C15T2	S4C15T2	30

Table 140. Cable installation order for systems with 62 links per network using the 8 and 7 configuration for Switch Port Connection cards

Switch port connection order		
Switch 3	**Switch 4**	**CO**
S3C3T1	S4C3T1	17
S3C3T2	S4C3T2	18
S3C4T1	S4C4T1	19
S3C4T2	S4C4T2	20
S3C7T1	S4C7T1	21
S3C7T2	S4C7T2	22
S3C8T1	S4C8T1	23
S3C8T2	S4C8T2	24
S3C11T1	S4C11T1	25
S3C11T2	S4C11T2	26
S3C12T1	S4C12T1	27
S3C12T2	S4C12T2	28
S3C15T1	S4C15T1	29
S3C15T2	S4C15T2	30
S3C16T1	NA	31
S3C16T2	NA	32

Table 141. Cable installation order for systems with 64 links per network using the 8 and 8 configuration for Switch Port Connection cards (fully populated switches)

Switch port connection order		
Switch 3	**Switch 4**	**CO**
S3C3T1	S4C3T1	17
S3C3T2	S4C3T2	18
S3C4T1	S4C4T1	19
S3C4T2	S4C4T2	20
S3C7T1	S4C7T1	21
S3C7T2	S4C7T2	22
S3C8T1	S4C8T1	23
S3C8T2	S4C8T2	24
S3C11T1	S4C11T1	25
S3C11T2	S4C11T2	26
S3C12T1	S4C12T1	27
S3C12T2	S4C12T2	28
S3C15T1	S4C15T1	29
S3C15T2	S4C15T2	30
S3C16T1	S4C16T1	31
S3C16T2	S4C16T2	32

Systems with 5 NSBs per network (single network configurations only): The tables in this section list the connection order for:

- A single network system with 5 NSBs
  - Supports up to 80 links per system
  - Requires four ISB configured switches
- **The tables in this section cannot be used with dual network configurations.**

Note: When you add links to a system, you must do so with pairs of links. Because of that, all systems must have an even number of links.

A single network system with 33 and 40 server-to-switch, Switch Port Connection cards (66 to 80 links) requires five NSB configured switches plus four ISB configured switches. A single network system with five NSBs will have two fully populated switch pairs and a non-paired switch. The two fully populated NSB pairs are the first to get cabled and the connection order for those switches is the same as what is listed in Table 125 on page 425 (for the first pair) and in Table 141 (for the second pair). You must use those tables to cable the first four switches on the network.

The connection order for the fifth switch is dependent on the number of server-to-switch, SPC cards installed in that switch. Using the number of SPC cards (or links) in your system, choose the appropriate table. For systems with:

- 66 links (single network configurations only):
  - Thirty-three SPC cards per system
  - One SPC card in switch 5
  - Refer to Table 142 on page 436
- 68 links (single network configurations only):
  - Thirty-four SPC cards per system
  - Two SPC cards in switch 5
  - Refer to Table 143 on page 436

- 70 links (single network configurations only):
  – Thirty-five SPC cards per system
  – One SPC card in switch 5
  – Three SPC cards in switch 5
  – Refer to Table 144 on page 437
- 72 links (single network configurations only):
  – Thirty-six SPC cards per system
  – One SPC card in switch 5
  – Four SPC cards in switch 5
  – Refer to Table 145 on page 437
- 74 links (single network configurations only):
  – Thirty- seven SPC cards per system
  – One SPC card in switch 5
  – Five SPC cards in switch 5
  – Refer to Table 146 on page 437
- 76 links (single network configurations only):
  – Thirty-eight SPC cards per system
  – One SPC card in switch 5
  – Six SPC cards in switch 5
  – Refer to Table 147 on page 438
- 78 links (single network configurations only):
  – Thirty-nine SPC cards per system
  – One SPC card in switch 5
  – Seven SPC cards in switch 5
  – Refer to Table 148 on page 438
- 80 links (single network configurations only):
  – Forty SPC cards per system
  – One SPC card in switch 5
  – Eight SPC cards in switch 5
  – Refer to Table 149 on page 439

Note: These tables do not include the switch port connections for the ISBs required in this configuration.

Table 142. Cable installation order for switch 5 with one Switch Port Connection card (single network, 66 links)

Switch port connection order	
Switch 5	**CO**
S5C3T1	33
S5C3T2	34

Table 143. Cable installation order for switch 5 with two Switch Port Connection cards (single network, 68 links)

Switch port connection order	
Switch 5	**CO**
S5C3T1	33
S5C3T2	34
S5C7T1	35
S5C7T2	36

Table 144. Cable installation order for switch 5 with three Switch Port Connection cards (single network, 70 links)

Switch port connection order	
Switch 5	**CO**
S5C3T1	33
S5C3T2	34
S5C7T1	35
S5C7T2	36
S5C11T1	37
S5C11T2	38

Table 145. Cable installation order for switch 5 with four Switch Port Connection cards (single network, 72 links)

Switch port connection order	
Switch 5	**CO**
S5C3T1	33
S5C3T2	34
S5C7T1	35
S5C7T2	36
S5C11T1	37
S5C11T2	38
S5C15T1	39
S5C15T2	40

Table 146. Cable installation order for switch 5 with five Switch Port Connection cards (single network, 74 links)

Switch port connection order	
Switch 5	**CO**
S5C3T1	33
S5C3T2	34
S5C4T1	35
S5C4T2	36
S5C7T1	37
S5C7T2	38

Table 146. Cable installation order for switch 5 with five Switch Port Connection cards (single network, 74 links) (continued)

Switch port connection order	
Switch 5	**CO**
S5C11T1	39
S5C11T2	40
S5C15T1	41
S5C15T2	42

Table 147. Cable installation order for switch 5 with six Switch Port Connection cards (single network, 76 links)

Switch port connection order	
Switch 5	**CO**
S5C3T1	33
S5C3T2	34
S5C4T1	35
S5C4T2	36
S5C7T1	37
S5C7T2	38
S5C8T1	39
S5C8T2	40
S5C11T1	41
S5C11T2	42
S5C15T1	43
S5C15T2	44

Table 148. Cable installation order for switch 3 with seven Switch Port Connection cards (single network, 78 links)

Switch port connection order	
Switch 5	**CO**
S5C3T1	33
S5C3T2	34
S5C4T1	35
S5C4T2	36
S5C7T1	37
S5C7T2	38
S5C8T1	39
S5C8T2	40
S5C11T1	41

Table 148. Cable installation order for switch 3 with seven Switch Port Connection cards (single network, 78 links) (continued)

Switch port connection order	
Switch 5	**CO**
S5C11T2	42
S5C12T1	43
S5C12T2	44
S5C15T1	45
S5C15T2	46

Table 149. Cable installation order for switch 5 with eight Switch Port Connection cards (single network, 80 links, fully populated switch)

Switch port connection order	
Switch 5	**CO**
S5C3T1	33
S5C3T2	34
S5C4T1	35
S5C4T2	36
S5C7T1	37
S5C7T2	38
S5C8T1	39
S5C8T2	40
S5C11T1	41
S5C11T2	42
S5C12T1	43
S5C12T2	44
S5C15T1	45
S5C15T2	46
S5C16T1	47
S5C16T2	48

Systems with 6 NSBs per network (single network configurations only): The tables in this section list the connection order for:

- A single network system with 6 NSBs
  - Supports up to 96 links per system
  - Requires four ISB configured switches
- **The tables in this section cannot be used with dual network configurations.**

Note: When you add links to a system, you must do so with pairs of links. Because of that, all systems must have an even number of links.

A single network system with 41 to 48 server-to-switch, Switch Port Connection cards (81 to 96 links) requires six NSB configured switches plus four ISB configured switches. A single network system with six NSBs on a single network will have two fully populated switch pairs and an additional pair of switches that may be partially populated. The two fully populated NSB pairs are the first to get cabled and the connection order for those switches is the same as what is listed in Table 125 on page 425 (for the first fully populated pair) and in Table 141 on page 435 (for the second fully populated pair). You must use those tables to cable the first four switches on the network.

The connection order for the third switch pair is dependent on the number of server-to-switch, SPC cards installed in that switch. Using the number of SPC cards (or links) in your system, choose the appropriate table. For systems with:

- 82 links (single network configurations only):
  - Forty-one SPC cards per system
  - Five SPC cards in switch 5 and four SPC cards in switch 6 **(6 NSB, 5 and 4 configuration)**
  - Refer to Table 150
- 84 links (single network configurations only):
  - Forty-two SPC cards per system
  - Five SPC cards in switch 5 and five SPC cards in switch 6 **(6 NSB, 5 and 5 configuration)**
  - Refer to Table 151 on page 441
- 86 links (single network configurations only):
  - Forty-three SPC cards per system
  - Six SPC cards in switch 5 and five SPC cards in switch 6 **(6 NSB, 6 and 5 configuration)**
  - Refer to Table 152 on page 441
- 88 links (single network configurations only):
  - Forty-four SPC cards per system
  - Six SPC cards in switch 5 and six SPC cards in switch 6 **(6 NSB, 6 and 6 configuration)**
  - Refer to Table 153 on page 442
- 90 links (single network configurations only):
  - Forty-five SPC cards per system
  - Seven SPC cards in switch 5 and six SPC cards in switch 6 **(6 NSB, 7 and 6 configuration)**
  - Refer to Table 154 on page 443
- 92 links (single network configurations only):
  - Forty-six SPC cards per system
  - Seven SPC cards in switch 5 and seven SPC cards in switch 6 **(6 NSB, 7 and 7 configuration)**
  - Refer to Table 155 on page 443
- 94 links (single network configurations only):
  - Forty-seven SPC cards per system
  - Eight SPC cards in switch 5 and seven SPC cards in switch 6 **(6 NSB, 8 and 7 configuration)**
  - Refer to Table 156 on page 444
- 96 links (single network configurations only):
  - Forty-eight SPC cards per system
  - Eight SPC cards in switch 5 and eight SPC cards in switch 6 **(6 NSB, 8 and 8 configuration)**
  - Refer to Table 157 on page 444

Note: These tables do not include the switch port connections for the ISBs required in this configuration.

Table 150. Cable installation order for single network systems with 82 links using the 5 and 4 configuration for Switch Port Connection cards

Switch port connection order		
Switch 5	**Switch 6**	**CO**
S5C3T1	S6C3T1	33
S5C3T2	S6C3T2	34
S5C4T1	NA	35
S5C4T2	NA	36
S5C7T1	S6C7T1	37

Table 150. Cable installation order for single network systems with 82 links using the 5 and 4 configuration for Switch Port Connection cards (continued)

Switch port connection order		
Switch 5	**Switch 6**	**CO**
S5C7T2	S6C7T2	38
S5C11T1	S6C11T1	39
S5C11T2	S6C11T2	40
S5C15T1	S6C15T1	41
S5C15T2	S6C15T2	42

Table 151. Cable installation order for single network systems with 84 links using the 5 and 5 configuration for Switch Port Connection cards

Switch port connection order		
Switch 5	**Switch 6**	**CO**
S5C3T1	S6C3T1	33
S5C3T2	S6C3T2	34
S5C4T1	S6C4T1	35
S5C4T2	S6C4T2	36
S5C7T1	S6C7T1	37
S5C7T2	S6C7T2	38
S5C11T1	S6C11T1	39
S5C11T2	S6C11T2	40
S5C15T1	S6C15T1	41
S5C15T2	S6C15T2	42

Table 152. Cable installation order for single network systems with 86 links using the 6 and 5 configuration for Switch Port Connection cards

Switch port connection order		
Switch 5	**Switch 6**	**CO**
S5C3T1	S6C3T1	33
S5C3T2	S6C3T2	34

Table 152. Cable installation order for single network systems with 86 links using the 6 and 5 configuration for Switch Port Connection cards (continued)

Switch port connection order		
Switch 5	**Switch 6**	**CO**
S5C4T1	S6C4T1	35
S5C4T2	S6C4T2	36
S5C7T1	S6C7T1	37
S5C7T2	S6C7T2	38
S5C8T1	NA	39
S5C8T2	NA	40
S5C11T1	S6C11T1	41
S5C11T2	S6C11T2	42
S5C15T1	S6C15T1	43
S5C15T2	S6C15T2	44

Table 153. Cable installation order for single network systems with 88 links using the 6 and 6 configuration for Switch Port Connection cards

Switch port connection order		
Switch 5	**Switch 6**	**CO**
S5C3T1	S6C3T1	33
S5C3T2	S6C3T2	34
S5C4T1	S6C4T1	35
S5C4T2	S6C4T2	36
S5C7T1	S6C7T1	37
S5C7T2	S6C7T2	38
S5C8T1	S6C8T1	39
S5C8T2	S6C8T2	40
S5C11T1	S6C11T1	41
S5C11T2	S6C11T2	42
S5C15T1	S6C15T1	43
S5C15T2	S6C15T2	44

Table 154. Cable installation order for single network systems with 90 links using the 7 and 6 configuration for Switch Port Connection cards

Switch port connection order		
Switch 5	**Switch 6**	**CO**
S5C3T1	S6C3T1	33
S5C3T2	S6C3T2	34
S5C4T1	S6C4T1	35
S5C4T2	S6C4T2	36
S5C7T1	S6C7T1	37
S5C7T2	S6C7T2	38
S5C8T1	S6C8T1	39
S5C8T2	S6C8T2	40
S5C11T1	S6C11T1	41
S5C11T2	S6C11T2	42
S5C12T1	NA	43
S5C12T2	NA	44
S5C15T1	S6C15T1	45
S5C15T2	S6C15T2	46

Table 155. Cable installation order for single network systems with 92 links using the 7 and 7 configuration for Switch Port Connection cards

Switch port connection order		
Switch 5	**Switch 6**	**CO**
S5C3T1	S6C3T1	33
S5C3T2	S6C3T2	34
S5C4T1	S6C4T1	35
S5C4T2	S6C4T2	36
S5C7T1	S6C7T1	37
S5C7T2	S6C7T2	38
S5C8T1	S6C8T1	39
S5C8T2	S6C8T2	40
S5C11T1	S6C11T1	41
S5C11T2	S6C11T2	42
S5C12T1	S6C12T1	43
S5C12T2	S6C12T2	44
S5C15T1	S6C15T1	45
S5C15T2	S6C15T2	46

Table 156. Cable installation order for single network systems with 94 links using the 8 and 7 configuration for Switch Port Connection cards

Switch port connection order		
Switch 5	**Switch 6**	**CO**
S5C3T1	S6C3T1	33
S5C3T2	S6C3T2	34
S5C4T1	S6C4T1	35
S5C4T2	S6C4T2	36
S5C7T1	S6C7T1	37
S5C7T2	S6C7T2	38
S5C8T1	S6C8T1	39
S5C8T2	S6C8T2	40
S5C11T1	S6C11T1	41
S5C11T2	S6C11T2	42
S5C12T1	S6C12T1	43
S5C12T2	S6C12T2	44
S5C15T1	S6C15T1	45
S5C15T2	S6C15T2	46
S5C16T1	NA	47
S5C16T2	NA	48

Table 157. Cable installation order for single network systems with 96 links using the 8 and 8 configuration for Switch Port Connection cards (fully populated switches)

Switch port connection order		
Switch 5	**Switch 6**	**CO**
S5C3T1	S6C3T1	33
S5C3T2	S6C3T2	34
S5C4T1	S6C4T1	35
S5C4T2	S6C4T2	36
S5C7T1	S6C7T1	37
S5C7T2	S6C7T2	38
S5C8T1	S6C8T1	39
S5C8T2	S6C8T2	40
S5C11T1	S6C11T1	41
S5C11T2	S6C11T2	42
S5C12T1	S6C12T1	43
S5C12T2	S6C12T2	44
S5C15T1	S6C15T1	45
S5C15T2	S6C15T2	46
S5C16T1	S6C16T1	47
S5C16T2	S6C16T2	48

Systems with 7 NSBs per network (single network configurations only): The tables in this section list the connection order for:

- A single network system with 7 NSBs
  - Supports up to 112 links per system
  - Requires four ISB configured switches
- **The tables in this section cannot be used with dual network configurations.**

Note: When you add links to a system, you must do so with pairs of links. Because of that, all systems must have an even number of links.

A single network system with 49 to 56 server-to-switch, Switch Port Connection cards (97 to 112 links) requires seven NSB configured switches plus four ISB configured switches. A single network system with seven NSBs will have three fully populated switch pairs and a non-paired switch. The three fully populated switch pairs are the first to get cabled and the connection order for those switches is the same as what is listed in Table 125 on page 425 (for the first pair), Table 141 on page 435 (for the second pair), and in Table 157 on page 444 (for the third pair). You must use those tables to cable the first six switches on the network.

The connection order for the seventh switch is dependent on the number of server-to-switch, SPC cards installed in that switch. Using the number of SPC cards (or links) in your system, choose the appropriate table. For systems with:

- 98 links (single network configurations only):
  - Forty-nine SPC cards per system
  - One SPC card in switch 7
  - Refer to Table 158 on page 446
- 100 links (single network configurations only):
  - Fifty SPC cards per system
  - Two SPC cards in switch 7
  - Refer to Table 159 on page 446
- 102 links (single network configurations only):
  - Fifty-one SPC cards per system
  - Three SPC cards in switch 7
  - Refer to Table 160 on page 446
- 104 links (single network configurations only):
  - Fifty-two SPC cards per system
  - Four SPC cards in switch 7
  - Refer to Table 161 on page 446
- 106 links (single network configurations only):
  - Fifty-three SPC cards per system
  - Five SPC cards in switch 7
  - Refer to Table 162 on page 447
- 108 links (single network configurations only):
  - Fifty-four SPC cards per system
  - Six SPC cards in switch 7
  - Refer to Table 163 on page 447
- 110 links (single network configurations only):
  - Fifty-five SPC cards per system
  - Seven SPC cards in switch 7
  - Refer to Table 164 on page 448
- 112 links (single network configurations only):
  - Fifty-six SPC cards per system
  - Eight SPC cards in switch 7
  - Refer to Table 165 on page 448

Note: These tables do not include the switch port connections for the ISBs required in this configuration.

Table 158. Cable installation order for switch 7 with one Switch Port Connection card (single network, 98 links)

Switch port connection order	
Switch 7	**CO**
S7C3T1	49
S7C3T2	50

Table 159. Cable installation order for switch 7 with two Switch Port Connection cards (single network, 100 links)

Switch port connection order	
Switch 7	**CO**
S7C3T1	49
S7C3T2	50
S7C7T1	51
S7C7T2	52

Table 160. Cable installation order for switch 7 with three Switch Port Connection cards (single network, 102 links)

Switch port connection order	
Switch 7	**CO**
S7C3T1	49
S7C3T2	50
S7C7T1	51
S7C7T2	52
S7C11T1	53
S7C11T2	54

Table 161. Cable installation order for switch 7 with four Switch Port Connection cards (single network, 104 links)

Switch port connection order	
Switch 7	**CO**
S7C3T1	49
S7C3T2	50
S7C7T1	51
S7C7T2	52

Table 161. Cable installation order for switch 7 with four Switch Port Connection cards (single network, 104 links) (continued)

Switch port connection order	
Switch 7	**CO**
S7C11T1	53
S7C11T2	54
S7C15T1	55
S7C15T2	56

Table 162. Cable installation order for switch 7 with five Switch Port Connection cards (single network, 106 links)

Switch port connection order	
Switch 7	**CO**
S7C3T1	49
S7C3T2	50
S7C4T1	51
S7C4T2	52
S7C7T1	53
S7C7T2	54
S7C11T1	55
S7C11T2	56
S7C15T1	57
S7C15T2	58

Table 163. Cable installation order for switch 7 with six Switch Port Connection cards (single network, 108 links)

Switch port connection order	
Switch 7	**CO**
S7C3T1	49
S7C3T2	50
S7C4T1	51
S7C4T2	52
S7C7T1	53
S7C7T2	54
S7C8T1	55
S7C8T2	56
S7C11T1	57
S7C11T2	58

Table 163. Cable installation order for switch 7 with six Switch Port Connection cards (single network, 108 links) (continued)

Switch port connection order	
Switch 7	**CO**
S7C15T1	59
S7C15T2	60

Table 164. Cable installation order for switch 7 with seven Switch Port Connection cards (single network, 110 links)

Switch port connection order	
Switch 7	**CO**
S7C3T1	49
S7C3T2	50
S7C4T1	51
S7C4T2	52
S7C7T1	53
S7C7T2	54
S7C8T1	55
S7C8T2	56
S7C11T1	57
S7C11T2	58
S7C12T1	59
S7C12T2	60
S7C15T1	61
S7C15T2	62

Table 165. Cable installation order for switch 7 with eight Switch Port Connection cards (single network, 112 links, fully populated switch)

Switch port connection order	
Switch 7	**CO**
S7C3T1	49
S7C3T2	50
S7C4T1	51
S7C4T2	52
S7C7T1	53
S7C7T2	54
S7C8T1	55
S7C8T2	56
S7C11T1	57
S7C11T2	58

Table 165. Cable installation order for switch 7 with eight Switch Port Connection cards (single network, 112 links, fully populated switch) (continued)

Switch port connection order	
Switch 7	**CO**
S7C12T1	59
S7C12T2	60
S7C15T1	61
S7C15T2	62
S7C16T1	63
S7C16T2	64

Systems with 8 NSBs per network (single network configurations only): The tables in this section list the connection order for:

- A single network system with 8 NSBs
  - Supports up to 128 links per system
  - Requires four ISB configured switches
- For information on using the tables in this section with 16 NSB dual network configurations, refer to “Dual network systems with 16 NSBs” on page 454

Note: When you add links to a system, you must do so with pairs of links. Because of that, all systems must have an even number of links.

A single network system with 57 to 64 server-to-switch, Switch Port Connection cards (113 to 128 links) requires eight NSB configured switches plus four ISB configured switches. A single network system with eight NSBs on a single network will have three fully populated switch pairs and an additional pair of switches that may be partially populated. The three fully populated NSB pairs are the first to get cabled and the connection order for those switches is the same as what is listed in Table 125 on page 425 (for the first fully populated pair), Table 141 on page 435 (for the second fully populated pair), and in Table 157 on page 444 (for the third fully populated switch pair). You must use those tables to cable the first six switches on the network.

The connection order for the fourth switch pair is dependent on the number of server-to-switch, SPC cards installed in those switches. Using the number of SPC cards (or links) in your system, choose the appropriate table. For systems with:

- 114 links (single network configurations only):
  - Fifty-seven SPC cards per system
  - Five SPC cards in switch 7 and four SPC cards in switch 8 **(8 NSB, 5 and 4 configuration)**
  - Refer to Table 166 on page 450
- 116 links (single network configurations only):
  - Fifty-eight SPC cards per system
  - Five SPC cards in switch 7 and five SPC cards in switch 8 **(8 NSB, 5 and 5 configuration)**
  - Refer to Table 167 on page 450
- 118 links (single network configurations only):
  - Fifty-nine SPC cards per system
  - Six SPC cards in switch 7 and five SPC cards in switch 8 **(8 NSB, 6 and 5 configuration)**
  - Refer to Table 168 on page 451
- 120 links (single network configurations only):
  - Sixty SPC cards per system
  - Six SPC cards in switch 7 and six SPC cards in switch 8 **(8 NSB, 6 and 6 configuration)**
  - Refer to Table 169 on page 451
- 122 links (single network configurations only):

- Sixty-one SPC cards per system
- Seven SPC cards in switch 7 and six SPC cards in switch 8 **(8 NSB, 7 and 6 configuration)**
- Refer to Table 170 on page 452

- 124 links (single network configurations only):
  - Sixty-two SPC cards per system
  - Seven SPC cards in switch 7 and seven SPC cards in switch 8 **(8 NSB, 7 and 7 configuration)**
  - Refer to Table 171 on page 453
- 126 links (single network configurations only):
  - Sixty-three SPC cards per system
  - Eight SPC cards in switch 7 and seven SPC cards in switch 8 **(8 NSB, 8 and 7 configuration)**
  - Refer to Table 172 on page 453
- 128 links (single network configurations only):
  - Sixty-four SPC cards per system
  - Eight SPC cards in switch 7 and eight SPC cards in switch 8 **(8 NSB, 8 and 8 configuration)**
  - Refer to Table 173 on page 454

Note: These tables do not include the switch port connections for the ISBs required in this configuration.

Table 166. Cable installation order for single network systems with 114 links using the 5 and 4 configuration for Switch Port Connection cards

Switch port connection order		
Switch 5	**Switch 6**	**CO**
S5C3T1	S6C3T1	49
S5C3T2	S6C3T2	50
S5C4T1	NA	51
S5C4T2	NA	52
S5C7T1	S6C7T1	53
S5C7T2	S6C7T2	54
S5C11T1	S6C11T1	55
S5C11T2	S6C11T2	56
S5C15T1	S6C15T1	57
S5C15T2	S6C15T2	58

Table 167. Cable installation order for single network systems with 116 links using the 5 and 5 configuration for Switch Port Connection cards

Switch port connection order		
Switch 5	**Switch 6**	**CO**
S5C3T1	S6C3T1	49
S5C3T2	S6C3T2	50
S5C4T1	S6C4T1	51
S5C4T2	S6C4T2	52

Table 167. Cable installation order for single network systems with 116 links using the 5 and 5 configuration for Switch Port Connection cards (continued)

Switch port connection order		
Switch 5	**Switch 6**	**CO**
S5C7T1	S6C7T1	53
S5C7T2	S6C7T2	54
S5C11T1	S6C11T1	55
S5C11T2	S6C11T2	56
S5C15T1	S6C15T1	57
S5C15T2	S6C15T2	58

Table 168. Cable installation order for single network systems with 118 links using the 6 and 5 configuration for Switch Port Connection cards

Switch port connection order		
Switch 5	**Switch 6**	**CO**
S5C3T1	S6C3T1	49
S5C3T2	S6C3T2	50
S5C4T1	S6C4T1	51
S5C4T2	S6C4T2	52
S5C7T1	S6C7T1	53
S5C7T2	S6C7T2	54
S5C8T1	NA	55
S5C8T2	NA	56
S5C11T1	S6C11T1	57
S5C11T2	S6C11T2	58
S5C15T1	S6C15T1	59
S5C15T2	S6C15T2	60

Table 169. Cable installation order for single network systems with 120 links using the 6 and 6 configuration for Switch Port Connection cards

Switch port connection order		
Switch 5	**Switch 6**	**CO**
S5C3T1	S6C3T1	49

Table 169. Cable installation order for single network systems with 120 links using the 6 and 6 configuration for Switch Port Connection cards (continued)

Switch port connection order		
Switch 5	**Switch 6**	**CO**
S5C3T2	S6C3T2	50
S5C4T1	S6C4T1	51
S5C4T2	S6C4T2	52
S5C7T1	S6C7T1	53
S5C7T2	S6C7T2	54
S5C8T1	S6C8T1	55
S5C8T2	S6C8T2	56
S5C11T1	S6C11T1	57
S5C11T2	S6C11T2	58
S5C15T1	S6C15T1	59
S5C15T2	S6C15T2	60

Table 170. Cable installation order for single network systems with 122 links using the 7 and 6 configuration for Switch Port Connection cards

Switch port connection order		
Switch 5	**Switch 6**	**CO**
S5C3T1	S6C3T1	49
S5C3T2	S6C3T2	50
S5C4T1	S6C4T1	51
S5C4T2	S6C4T2	52
S5C7T1	S6C7T1	53
S5C7T2	S6C7T2	54
S5C8T1	S6C8T1	55
S5C8T2	S6C8T2	56
S5C11T1	S6C11T1	57
S5C11T2	S6C11T2	58
S5C12T1	NA	59
S5C12T2	NA	60
S5C15T1	S6C15T1	61
S5C15T2	S6C15T2	62

Table 171. Cable installation order for single network systems with 124 links using the 7 and 7 configuration for Switch Port Connection cards

Switch port connection order		
Switch 5	**Switch 6**	**CO**
S5C3T1	S6C3T1	49
S5C3T2	S6C3T2	50
S5C4T1	S6C4T1	51
S5C4T2	S6C4T2	52
S5C7T1	S6C7T1	53
S5C7T2	S6C7T2	54
S5C8T1	S6C8T1	55
S5C8T2	S6C8T2	56
S5C11T1	S6C11T1	57
S5C11T2	S6C11T2	58
S5C12T1	S6C12T1	59
S5C12T2	S6C12T2	60
S5C15T1	S6C15T1	61
S5C15T2	S6C15T2	62

Table 172. Cable installation order for single network systems with 126 links using the 8 and 7 configuration for Switch Port Connection cards

Switch port connection order		
Switch 5	**Switch 6**	**CO**
S5C3T1	S6C3T1	49
S5C3T2	S6C3T2	50
S5C4T1	S6C4T1	51
S5C4T2	S6C4T2	52
S5C7T1	S6C7T1	53
S5C7T2	S6C7T2	54
S5C8T1	S6C8T1	55
S5C8T2	S6C8T2	56
S5C11T1	S6C11T1	57
S5C11T2	S6C11T2	58
S5C12T1	S6C12T1	59
S5C12T2	S6C12T2	60
S5C15T1	S6C15T1	61
S5C15T2	S6C15T2	62
S5C16T1	NA	63
S5C16T2	NA	64

Table 173. Cable installation order for single network systems with 128 links using the 8 and 8 configuration for Switch Port Connection cards (fully populated switches)

Switch port connection order		
Switch 5	**Switch 6**	**CO**
S5C3T1	S6C3T1	49
S5C3T2	S6C3T2	50
S5C4T1	S6C4T1	51
S5C4T2	S6C4T2	52
S5C7T1	S6C7T1	53
S5C7T2	S6C7T2	54
S5C8T1	S6C8T1	55
S5C8T2	S6C8T2	56
S5C11T1	S6C11T1	57
S5C11T2	S6C11T2	58
S5C12T1	S6C12T1	59
S5C12T2	S6C12T2	60
S5C15T1	S6C15T1	61
S5C15T2	S6C15T2	62
S5C16T1	S6C16T1	63
S5C16T2	S6C16T2	64

Dual network systems with 16 NSBs: A dual network system with 128 server-to-switch, Switch Port Connection cards (256 links) requires sixteen NSB configured switches plus eight ISB configured switches. With 256 links, all switches will be fully populated. To cable this network configuration use:

- Table 125 on page 425 for the first fully populated pair on each network
- Table 141 on page 435 for the second fully populated pair on each network
- Table 157 on page 444 for the third fully populated switch pair on each network
- Table 173 for the fourth fully populated switch pair on each network

Notes:

1. Each network of a 256 link dual network configuration is cabled the same as a fully populated 128 link network. Refer to Figure 73 on page 346 for an illustration of this configuration.
2. For dual networks with 130 to 254 links, refer to “Cabling non-standard networks” on page 338.

Examples of completed switch port connection tables

This section has examples of completed switch port connection tables for:

- Fully populated switch pairs
- Partially populated switch pairs
- A non-paired switch

Fully populated paired switch example

Refer to Table 125 on page 425 for permutations.

The switch tables for a fully populated pair would have the following connection order:

Switch number	Switch chip 5 (slots 3 and 4)		Switch chip 7 (slots 7 and 8)		Switch chip 6 (slots 11 and 12)		Switch chip 4 (slots 15 and 16)	
1	Port location	CO	Port location	CO	Port location	CO	Port location	CO
Odd numbered NSB slots	C3T1	1	C7T1	5	C11T1	9	C15T1	13
	C3T2	2	C7T2	6	C11T2	10	C15T2	14
Even numbered NSB slots	C4T1	3	C8T1	7	C12T1	11	C16T1	15
	C4T2	4	C8T2	8	C12T2	12	C16T2	16

Notes:
1. CO: Connection Order
2. Port locations listed in this table are for server to switch connections only

Switch number	Switch chip 5 (slots 3 and 4)		Switch chip 7 (slots 7 and 8)		Switch chip 6 (slots 11 and 12)		Switch chip 4 (slots 15 and 16)	
2	Port location	CO	Port location	CO	Port location	CO	Port location	CO
Odd numbered NSB slots	C3T1	1	C7T1	5	C11T1	9	C15T1	13
	C3T2	2	C7T2	6	C11T2	10	C15T2	14
Even numbered NSB slots	C4T1	3	C8T1	7	C12T1	11	C16T1	15
	C4T2	4	C8T2	8	C12T2	12	C16T2	16

Notes:
1. CO: Connection Order
2. Port locations listed in this table are for server to switch connections only

Partially populated paired switch example

Refer to Table 136 on page 432 for permutations.

For this example, the system requires 27 Switch Port Connection cards (for 54 links) installed in four switches. The first 16 SPC cards (for 32 links) fully populate the first switch pair. The second switch pair is partially populated with 11 SPC cards (for 22 links) installed into switch 3 and switch 4 in the following order:

1. Switch 3 slot 3
2. Switch 4 slot 3
3. Switch 3 slot 7
4. Switch 4 slot 7
5. Switch 3 slot 11
6. Switch 4 slot 11
7. Switch 3 slot 15
8. Switch 4 slot 15
9. Switch 3 slot 4
10. Switch 4 slot 4
11. Switch 3 slot 8

Note: In this example switch 3 will have more cables attached than does switch 4.

The switch tables for the partially populated switch pair have the following connection order:

Switch number	Switch chip 5 (slots 3 and 4)		Switch chip 7 (slots 7 and 8)		Switch chip 6 (slots 11 and 12)		Switch chip 4 (slots 15 and 16)	
3	Port location	CO	Port location	CO	Port location	CO	Port location	CO
Odd numbered NSB slots	C3T1	17	C7T1	21	C11T1	25	C15T1	27
	C3T2	18	C7T2	22	C11T2	26	C15T2	28
Even numbered NSB slots	C4T1	19	C8T1	23		NA		NA
	C4T2	20	C8T2	24		NA		NA

Notes:
1. CO: Connection Order
2. Port locations listed in this table are for server to switch connections only

Switch number	Switch chip 5 (slots 3 and 4)		Switch chip 7 (slots 7 and 8)		Switch chip 6 (slots 11 and 12)		Switch chip 4 (slots 15 and 16)	
4	Port location	CO	Port location	CO	Port location	CO	Port location	CO
Odd numbered NSB slots	C3T1	17	C7T1	21	C11T1	23	C15T1	25
	C3T2	18	C7T2	22	C11T2	24	C15T2	26
Even numbered NSB slots	C4T1	19		NA		NA		NA
	C4T2	20		NA		NA		NA

Notes:
1. CO: Connection Order
2. Port locations listed in this table are for server to switch connections only

Non-paired switch example

Refer to Table 131 on page 428 for permutations.

For this example, the system requires 22 Switch Port Connection cards (44 links) installed in three switches. The first 16 SPC cards (32 links) fully populate the first switch pair. The third switch is partially populated with 6 SPC cards (12 links) installed in the following order:
1. Switch 3 slot 3
2. Switch 3 slot 7
3. Switch 3 slot 11
4. Switch 3 slot 15
5. Switch 3 slot 4
6. Switch 3 slot 8

The switch tables for the partially populated switch pair have the following connection order:

Switch number	Switch chip 5 (slots 3 and 4)		Switch chip 7 (slots 7 and 8)		Switch chip 6 (slots 11 and 12)		Switch chip 4 (slots 15 and 16)	
3	Port location	CO	Port location	CO	Port location	CO	Port location	CO
Odd numbered NSB slots	C3T1	1	C7T1	5	C11T1	9	C15T1	11
	C3T2	2	C7T2	6	C11T2	10	C15T2	12
Even numbered NSB slots	C4T1	3	C8T1	7		NA		NA
	C4T2	4	C8T2	8		NA		NA

Notes:
1. CO: Connection Order
2. Port locations listed in this table are for server to switch connections only

Switch port location table templates

The tables in this section have been partially completed and list the server-to-switch port locations available on each switch. Copy the appropriate tables to match the number of switches in your system and complete the connection order columns as described in the procedure. Depending on the number of links in your system, some switch ports that are listed in the tables may not be connected to SNI ports.

Note: Only server-to-switch port locations are listed in these tables. Switch-to-switch ports are not listed in these tables. Refer to Figure 69 on page 340 to see the association between switch chips and slots for Switch Port Connection cards.

Table 174. Switch 1 port locations

Switch number	Switch chip 5 (slots 3 and 4)		Switch chip 7 (slots 7 and 8)		Switch chip 6 (slots 11 and 12)		Switch chip 4 (slots 15 and 16)	
1	Port location	CO	Port location	CO	Port location	CO	Port location	CO
Odd numbered NSB slots	S1C3T1		S1C7T1		S1C11T1		S1C15T1	
	S1C3T2		S1C7T2		S1C11T2		S1C15T2	

Table 174. Switch 1 port locations (continued)

Switch number	Switch chip 5 (slots 3 and 4)		Switch chip 7 (slots 7 and 8)		Switch chip 6 (slots 11 and 12)		Switch chip 4 (slots 15 and 16)	
1	**Port location**	**CO**	**Port location**	**CO**	**Port location**	**CO**	**Port location**	**CO**
Even numbered NSB slots	S1C4T1		S1C8T1		S1C12T1		S1C16T1	
	S1C4T2		S1C8T2		S1C12T2		S1C16T2	

Notes:
1. CO: Connection Order
2. Port locations listed in this table are for server to switch connections only

Table 175. Switch 2 port locations

Switch number	Switch chip 5 (slots 3 and 4)		Switch chip 7 (slots 7 and 8)		Switch chip 6 (slots 11 and 12)		Switch chip 4 (slots 15 and 16)	
2	**Port location**	**CO**	**Port location**	**CO**	**Port location**	**CO**	**Port location**	**CO**
Odd numbered NSB slots	S2C3T1		S2C7T1		S2C11T1		S2C15T1	
	S2C3T2		S2C7T2		S2C11T2		S2C15T2	
Even numbered NSB slots	S2C4T1		S2C8T1		S2C12T1		S2C16T1	
	S2C4T2		S2C8T2		S2C12T2		S2C16T2	

Notes:
1. CO: Connection Order
2. Port locations listed in this table are for server to switch connections only

Table 176. Switch 3 port locations

Switch number	Switch chip 5 (slots 3 and 4)		Switch chip 7 (slots 7 and 8)		Switch chip 6 (slots 11 and 12)		Switch chip 4 (slots 15 and 16)	
3	**Port location**	**CO**	**Port location**	**CO**	**Port location**	**CO**	**Port location**	**CO**
Odd numbered NSB slots	S3C3T1		S3C7T1		S3C11T1		S3C15T1	
	S3C3T2		S3C7T2		S3C11T2		S3C15T2	
Even numbered NSB slots	S3C4T1		S3C8T1		S3C12T1		S3C16T1	
	S3C4T2		S3C8T2		S3C12T2		S3C16T2	

Notes:
1. CO: Connection Order
2. Port locations listed in this table are for server to switch connections only

Table 177. Switch 4 port locations

Switch number	Switch chip 5 (slots 3 and 4)		Switch chip 7 (slots 7 and 8)		Switch chip 6 (slots 11 and 12)		Switch chip 4 (slots 15 and 16)	
4	**Port location**	**CO**	**Port location**	**CO**	**Port location**	**CO**	**Port location**	**CO**
Odd numbered NSB slots	S4C3T1		S4C7T1		S4C11T1		S4C15T1	
	S4C3T2		S4C7T2		S4C11T2		S4C15T2	
Even numbered NSB slots	S4C4T1		S4C8T1		S4C12T1		S4C16T1	
	S4C4T2		S4C8T2		S4C12T2		S4C16T2	

Notes:
1. CO: Connection Order
2. Port locations listed in this table are for server to switch connections only

Table 178. Switch 5 port locations

Switch number	Switch chip 5 (slots 3 and 4)		Switch chip 7 (slots 7 and 8)		Switch chip 6 (slots 11 and 12)		Switch chip 4 (slots 15 and 16)	
5	**Port location**	**CO**	**Port location**	**CO**	**Port location**	**CO**	**Port location**	**CO**
Odd numbered NSB slots	S5C3T1		S5C7T1		S5C11T1		S5C15T1	
	S5C3T2		S5C7T2		S5C11T2		S5C15T2	
Even numbered NSB slots	S5C4T1		S5C8T1		S5C12T1		S5C16T1	
	S5C4T2		S5C8T2		S5C12T2		S5C16T2	

Notes:
1. CO: Connection Order
2. Port locations listed in this table are for server to switch connections only

Table 179. Switch 6 port locations

Switch number	Switch chip 5 (slots 3 and 4)		Switch chip 7 (slots 7 and 8)		Switch chip 6 (slots 11 and 12)		Switch chip 4 (slots 15 and 16)	
6	**Port location**	**CO**	**Port location**	**CO**	**Port location**	**CO**	**Port location**	**CO**
Odd numbered NSB slots	S6C3T1		S6C7T1		S6C11T1		S6C15T1	
	S6C3T2		S6C7T2		S6C11T2		S6C15T2	
Even numbered NSB slots	S6C4T1		S6C8T1		S6C12T1		S6C16T1	
	S6C4T2		S6C8T2		S6C12T2		S6C16T2	

Notes:
1. CO: Connection Order
2. Port locations listed in this table are for server to switch connections only

Table 180. Switch 7 port locations

Switch number	Switch chip 5 (slots 3 and 4)		Switch chip 7 (slots 7 and 8)		Switch chip 6 (slots 11 and 12)		Switch chip 4 (slots 15 and 16)	
7	**Port location**	**CO**	**Port location**	**CO**	**Port location**	**CO**	**Port location**	**CO**
Odd numbered NSB slots	S7C3T1		S7C7T1		S7C11T1		S7C15T1	
	S7C3T2		S7C7T2		S7C11T2		S7C15T2	
Even numbered NSB slots	S7C4T1		S7C8T1		S7C12T1		S7C16T1	
	S7C4T2		S7C8T2		S7C12T2		S7C16T2	

Notes:
1. CO: Connection Order
2. Port locations listed in this table are for server to switch connections only

Table 181. Switch 8 port locations

Switch number	Switch chip 5 (slots 3 and 4)		Switch chip 7 (slots 7 and 8)		Switch chip 6 (slots 11 and 12)		Switch chip 4 (slots 15 and 16)	
8	**Port location**	**CO**	**Port location**	**CO**	**Port location**	**CO**	**Port location**	**CO**
Odd numbered NSB slots	S8C3T1		S8C7T1		S8C11T1		S8C15T1	
	S8C3T2		S8C7T2		S8C11T2		S8C15T2	
Even numbered NSB slots	S8C4T1		S8C8T1		S8C12T1		S8C16T1	
	S8C4T2		S8C8T2		S8C12T2		S8C16T2	

Notes:
1. CO: Connection Order
2. Port locations listed in this table are for server to switch connections only

Server-SNI table template

This section has the server-SNI table template. Table 182 has enough rows for a network with 128 links. This information is used to connect server-to-switch cables. For information on switch-to-switch connections, refer to “Switch-to-switch cable connections” on page 341.

Note: Only copper cables may be used for server-to-switch connections. Fiber optic cable pairs are restricted to switch-to-switch connections.

Table 182. SNI to switch port location determination

Server number (N)	SNI location (S1 to S4)	SNI port number (Q1 or Q2)	SNI link address (N_S_Q)	Connection order	Corresponding switch port location	Switch cable serial number
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				

Table 182. SNI to switch port location determination (continued)

Server number (N)	SNI location (S1 to S4)	SNI port number (Q1 or Q2)	SNI link address (N_S_Q)	Connection order	Corresponding switch port location	Switch cable serial number
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
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N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				

Table 182. SNI to switch port location determination (continued)

Server number (N)	SNI location (S1 to S4)	SNI port number (Q1 or Q2)	SNI link address (N_S_Q)	Connection order	Corresponding switch port location	Switch cable serial number
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
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N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				

Table 182. SNI to switch port location determination (continued)

Server number (N)	SNI location (S1 to S4)	SNI port number (Q1 or Q2)	SNI link address (N_S_Q)	Connection order	Corresponding switch port location	Switch cable serial number
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
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N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				

Table 182. SNI to switch port location determination (continued)

Server number (N)	SNI location (S1 to S4)	SNI port number (Q1 or Q2)	SNI link address (N_S_Q)	Connection order	Corresponding switch port location	Switch cable serial number
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				
N	S	Q				

Notes:

1. Use the blank labels that are pre-attached to both ends of each copper switch cable to record the serial number on each cable.
2. This table is used for documenting server-to-switch connection locations. Refer to "Switch-to-switch cable connections" on page 347 for switch-to-switch connection locations.

Appendix E. High Performance Switch Network Manager (HPSNM)

DANGER

Electrical voltage and current from power, telephone, and communication cables are hazardous.

To avoid a shock hazard:

- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**
- **Connect all power cords to a properly wired and grounded electrical outlet. Ensure outlet supplies proper voltage and phase rotation according to the system rating plate.**
- **Connect any equipment that will be attached to this product to properly wired outlets.**
- **When possible, use one hand only to connect or disconnect signal cables.**
- **Never turn on any equipment when there is evidence of fire, water, or structural damage.**
- **Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.**
- **Connect and disconnect cables as described below when installing, moving, or opening covers on this product or attached devices.**

  To Disconnect:

  1. **Turn everything OFF (unless instructed otherwise).**
  2. **Remove power cords from the outlet.**
  3. **Remove signal cables from connectors.**
  4. **Remove all cables from devices.**

  To Connect:

  1. **Turn everything OFF (unless instructed otherwise)**
  2. **Attach all cables to devices.**
  3. **Attach signal cables to connectors.**
  4. **Attach power cords to outlet.**
  5. **Turn device ON.**

  (D005)

High Performance Switch Network Manager (HPSNM) initializes the HPS network, monitors network status, performs recovery for hardware errors, and provides error reporting. HPSNM also reports serviceable events to Service Focal Point if any network components need replacement (refer to "Service Focal Point (SFP)" on page 19). High Performance Switch Network Manager also provides options for either a GUI interface (requires "IBM Web-based System Manager GUI" on page 18) or a command line interface.

This appendix provides information on:

- "The HPSNM Graphical User Interface" on page 466
- "The HPSNM command line interface" on page 474
- "Switch network discovery" on page 478
- "HPSNM diagnostics and error recovery" on page 480

Note: If you change the switch topology, you must re-initialize the network. The service action used to change the topology determines which procedure you must use:

- Adding new switches: “Bringing the network online and reporting Installation Complete” on page 109
- Removing switches or returning switches to an operating network: “Network verification for topology changes” on page 162
- Significant changes to an operating network: “Required cluster cold start” on page 168

Attention: Some procedures require a service login ID and password that must be supplied by the System Administrator. Before starting a service action, verify that the administrator has provided this ID or equivalent access. Refer to “Service login ID” on page 56 for additional information.

The HPSNM Graphical User Interface

From the CSM Management Server, the IBM Web-based System Manager GUI provides you with access to the High Performance Switch Network Manager (HPSNM). Using HPSNM you can:

- View switch, SNI (adapter), Switch Port Connection card (riser), and link information
- Power switch boards on and off
- Perform diagnostic functions
- View power environmental information
- View software trace files (event logs)

Notes:

1. You can also access all HPSNM GUI functions through a command line (refer to “The HPSNM command line interface” on page 474)
2. Although HPSNM operates from the Management Server, you must access some functions from the HMC. These functions include:
   - Error logging
   - Error Log Analysis (ELA) information
   - VPD collection functions used by Inventory Scout

All network management functions are accessed directly from the HPS Network Manager panel or from one of these additional HPSNM panels:

1. “End-Point View panel” on page 468
2. “Switch Topology View panel” on page 470
3. “Management Properties panel” on page 472
4. “View Event Log panel” on page 472
5. “Display Cluster Components panel” on page 473
6. “Select Logical Topology panel” on page 474
7. “Select HPSNM ELA Master panel” on page 474

HPS Network Manager panel

The HPS Network Manager panel allows you to perform some tasks directly and also provides a central point to access additional network management panels. To access HPSNM:

1. Open the CSM System Manager GUI
   - Requires the service login ID provided by the System Administrator
2. In the GUI Navigation Area, expand the ″CSM Cluster″ folder
3. Select the ″HPS Network Manager″ icon
4. The ″HPS Network Manager″ panel opens

Scroll down through the HPS Network Manager panel until the ″Tasks″ list is visible. Each link in the Tasks list will open either a task dialog box or an additional network management panel. Task dialog boxes provide you with direct access to common functions such as: enabling and disabling HPSNM, listing network components, and establishing the network topology. The additional network management panels provide detailed network views from a variety of perspectives such as the view from the SNI or the view from the switch.

You can access the following tasks from the HPS Network Manager panel:

Display Cluster Components

Selecting ″Display Cluster Components″ opens a task dialog box that lists all servers and switches recognized by HPSNM. The ″Display Cluster Components″ dialog box summarizes the number of frames, switches, and servers visible to HPSNM. During installation, you will use this panel to verify that HPSNM recognizes all frames, switches, and servers in the network.

Select Logical Topology

Choosing ″Select Logical Topology″ opens a dialog box with a pulldown menu listing the supported network topologies. Each configuration choice shows the number of NSBs, ISBs, and endpoints for a fully populated network. If your network is not fully populated, select the topology that matches the number of NSBs and ISBs required for your configuration. Refer to Table 183 for the supported topology options.

Note: If your configuration uses dual networks, AIX treats each network as an independent network. HPSNM does not provide routes for passing messages between networks on these systems.

Table 183. Supported topology options

NSBs	ISBs	Maximum endpoints
1	0	16
2	0	32
3	0	48
4	2	64
8	4	128
16	8	256
16	16	256
32	16	512
64	64	1024
128	128	2048

Notes:

1. The topology options apply to each network in the system.
2. Configurations requiring more than 128 endpoints per network are only available by special bid.
   - A two network configuration may have up to 256 endpoints with 128 endpoints on each network.

Select HPSNM ELA Master

Choosing this option opens a task dialog box with two pulldown menus. The first menu allows you to choose the Current ELA *Master* HMC. The second pulldown menu allows you to choose the Current *Backup* ELA HMC. For additional information on these options, refer to “Select HPSNM ELA Master panel” on page 474.

Enable HPSNM for Switch Verification

This option enhances HPSNM functions for network verification. Selecting ″Enable HPSNM for

Switch Verification″ opens a task dialog box that starts the HPSNM daemon in verification mode. When the discovery process is complete, HPSNM writes network faults to error logs that you will use to complete the installation.

Notes:

1. You must use switch verification mode and the host-based verification tools for network discovery. For additional information, refer to “Bringing the network online and reporting Installation Complete” on page 109 and “Task 3: Run the host-based verification tools” on page 122.
2. Do not confuse ″Enable HPSNM for Switch Verification″ with the ″Enable HPSNM for Normal Mode″ task option.

Enable HPSNM for Normal Mode
After you have completed all installation tasks, you will select this task option. Selecting ″Enable HPSNM for Normal Mode″ opens a task dialog box that starts the HPSNM daemon for regular network traffic.

Note: Do not confuse ″Enable HPSNM for Normal Mode″ with ″Enable HPSNM for Switch Verification.″

End-Point View
Selecting the ″End-Point View″ task options opens an additional network management panel. Refer to “End-Point View panel” for a detailed description of this panel.

Switch Topology View
Selecting the ″Switch Topology View″ task options opens an additional network management panel. Refer to “Switch Topology View panel” on page 470 for a detailed description of this panel.

Notes:

1. If your configuration uses dual networks, AIX treats each network as an independent network. HPSNM does not provide routes for passing messages between networks on these systems.

Management Properties
Selecting the ″Management Properties″ task options opens an additional network management panel. Refer to “Management Properties panel” on page 472 for a detailed description of this panel.

View Event Log
Selecting the ″View Event Log″ task options opens an additional network management panel. Refer to “View Event Log panel” on page 472 for a detailed description of this panel.

Disable HPSNM Software
Selecting the ″Disable HPSNM Software″ task option opens a task dialog box that stops the HPSNM daemon for both verification mode and normal mode.

End-Point View panel

The End-Point View panel provides:

- Information about servers, SNIs (called adapters in the GUI), and switch ports known to the High Performance Switch Network Manager (HPSNM)
- Access to diagnostic tools for operations on SNI ports

When opened, the End-Point View panel shows all endpoints in the cluster. Each line represents a server in the cluster. If server data are not available, that line displays a message indicating no data.

By selecting server data lines, you may expanded the view to show information about each SNI known in the selected servers. The expanded view displays information about each SNI port in the selected servers and all of the routes and paths associated with those SNIs.

Notes:

1. The Adapter column and the Network column are empty unless a server data line is expanded.
2. The Port column and the Physical Location Code column are empty unless an SNI line is expanded.
3. If data lines are not expanded, the information shown in the columns for Route Status and Path Status pertain to the worst faults associated with the selected servers. You must expand each data line for additional details regarding device status.
4. For additional information on the End-Point View panel, refer to the online help.

Route Status and Path Status

As a message travels from an SNI port to the intended endpoint, it can take any one of four network connections as it passes through the switch chips on the switch planar. The HPSNM End-Point View provides you with the following information about these network connections:

- The Path Status column describes the operational state of each of the four possible network connection available to a message passing through the switch planar
- The Route Status column described the operational state of the actual path selected for passing the message through the switch planar

If the system response in the Route Status column displays a ″Pending″ condition, this indicates that the system is still working on establishing a specific route using the available paths. If the Route Status is ″Good,″ the system has established a specific route. If both the Route Status and the Path Status columns display either a ″Failed″ or ″Unknown″ conditions, then there is a network fault that requires further examination.

Main menu choices, End-Point View

File When clicked, the File menu choice gives you options to:

Expand All
Expands all server and SNI data information lines

Collapse All
Collapses all server and SNI data information lines

Refresh
Refreshes data in current window

Close Exits the current window and all panels opened under the current window

Selected
After selecting a server or SNI data line, clicking the Selected menu choice gives you options for:

Expand
Expands the selected server or SNI data information line

Collapse
Collapses the selected server or SNI data information line

Properties
Opens a Properties panel for the SNI or port selected. Port information includes information listing where the port is connected. Properties panels are not available for servers.

Diagnose
Intended for CE use, the Diagnose panel provides options for:

- Verify Link – available at the SNI (adapter) or port level (refer to “Link verification” on page 481)
- Wrap Test – only available at the port level (refer to “Wrap testing” on page 480)
- Line Continuity Test – only available at the port level (refer to “Line continuity” on page 480)

After the system runs the diagnostic test on the selected SNI, a new panel opens and displays the test results.

Route Table Status

Select the Route Table Status option when either the ″Route Status″ or ″Path Status″ columns in the End-Point View indicate that a switch or SNI has a fault. Problem indicators in the two status columns include ″Failed:Ideal,″ ″Unknown:Ideal,″ ″Failed:Modified,″ and ″Unknown:Modified.″ If a route has a status of ″Ideal,″ that route is not displayed. If all routes have a status of ″Ideal,″ the Route Table Status panel will be empty.

To obtain additional information about a route fault, highlight the data line for the device associated with that route and click the ″Route Table Status″ option under ″Selected″ on the main menu. This opens the ″Route Status″ panel which displays route details including the SNI location, the switch cable endpoint connection, the specific path across the switch planar, and the operational status of that path.

Path Table Status

Select the Path Table Status option when the ″Path Status″ column in the End-Point View indicates that a switch or SNI has a fault. Problem indicators in the Path Status column include ″Failed:Ideal,″ ″Unknown:Ideal,″ ″Failed:Modified,″ and ″Unknown:Modified.″ If all paths have a status of ″Ideal,″ the Path Table Status option is grayed out and unavailable.

To obtain additional information about path faults, highlight the data line for the device associated with those paths and click the ″Path Table Status″ option under ″Selected″ on the main menu. This opens the ″Path Status″ panel which displays details about the four possible paths that can be used for message passing across the switch planar. Path details include the SNI location and the status of each available path across the switch planar. The system reports the path status as either, ″Active,″ ″Inactive,″ or ″Unknown.″

Filter When clicked, the Filter menu choice gives you options to:

Edit Filter

Opens a dialog box where the user enters data values that limit displayed entries. For example specific frame numbers, slot numbers, and other components can be monitored.

Filter Off

Turns off all filters and returns panel display to the default. Also clears entries in the Edit Filter dialog box.

Switch Topology View panel

Through the Switch Topology View panel, the user can:

- Power on and power off the HPS
- View information about switches, chips, and links
- Perform diagnostic operations on switch links

When the Switch Topology View panel is opened, each line represents a switch in the cluster and the displayed information is for a single network. If switch data are not available, that line displays a message indicating no data.

Display options allow the user to specify which network components will be queried. For example, selected switch data lines may be expanded to show information about chips on the selected switch. Additionally, chip data lines may also be expanded to show port data and the port data contains information about individual links.

Notes:

1. The Chip column is empty unless a switch line is expanded.
2. The Port column and the Physical Location Code column are empty unless a chip line is expanded.
3. For additional information on the Switch Topology View panel, refer to the online help.
4. During verification, the Switch Topology panel provides a button for resetting the displayed network errors.
5. If your configuration uses dual networks, AIX treats each network as an independent network. HPSNM does not provide routes for passing messages between networks on these systems.

Main menu choices, Switch Topology View

File When clicked, the File menu choice gives you options to:

Expand All
Expands all switch and chip data information lines

Collapse All
Collapses all switch and chip data information lines

Refresh
Refreshes data in current window

Close Exits the current window and all panels opened under the current window

Selected
After selecting a switch or chip data line, clicking the Selected menu choice gives you options to:

Expand
Expands the selected switch or chip data information line

Collapse
Collapses the selected switch and chip data information line

Properties
Opens a Properties panel for the chip or port selected. Port information includes information listing where the port is connected. Properties panels are not available for switches.

Power If switch data lines are selected, the Power panel provides options for:
- Switch power on
- Switch power off

The Power option is not available if a chip or port data line is selected.

Diagnose
Intended for CE use, the Diagnose panel provides options for:
- Verify Link
  - If a port data line is selected, the Verify Link test is performed on the selected link.
  - If a chip data line is selected, the Verify Link test is performed on all ports of that chip.
- Wrap Test
  - If a port data line for an external switch link is selected, the Wrap Test is performed on the selected link.
  - If a port data line for an internal switch link is selected, the Wrap Test is not available.
  - If a chip or switch data line is selected, the Wrap Test entry is not available.
- Line Continuity Test
  - If a port data line is selected, the Line Continuity Test is performed on the selected link.
  - If a chip or switch data line is selected, the Line Continuity Test entry is not available.

Each diagnostic test opens dialog boxes as the test progresses. Information contained in the dialog box will guide you through any configuration tasks you may need to perform. After the system runs the diagnostic test, a new panel opens and displays the test results.

Power Environmentals
Clicking this option opens a panel displaying power and environment information. This information includes:
- DCA voltages
- DCA current measurements
- Internal DCA temperatures
- Switch chip temperatures

Multicast Table Status
Select the Multicast Table Status option when the ″Multicast Status″ column in the Switch Topology View indicates that a switch or SNI has a fault. Problem indicators in the Multicast Status column include ″Applied,″ ″Failed,″ ″Mixed,″ and ″Unknown.″ If the

system reports ″Mixed″ in the Multicast Status column, this indicates that one or more of the four paths associated with that device are reporting different status. You will have to expand that data line for additional details.

A ″Multicast″ is the way that a packet comes into a chip and gets broadcast out to all the ports. To obtain specific information about the Multicast, highlight the data line for the associated device and click the ″Multicast Table Status″ option under ″Selected″ on the main menu. This opens the ″Multicast Status″ panel and displays the device location as well as the reported status.

The Multicast Status panel uses ″Applied,″ ″Failed,″ and ″Unknown″ to describe the device status; this panel does not display ″Mixed″ status. The ″Multicast Status″ panel also displays numeric entries in the ″Expected″ and ″Actual″ columns. The system uses these numeric values to describe the information packet and track it through the network.

Filter When clicked, the Filter menu choice gives you options to:

Edit Filter
Opens a dialog box where the user enters data values that limit displayed entries. For example specific frame numbers, slot numbers, and other components can be monitored.

Filter Off
Turns off all filters and returns panel display to the default. Also clears entries in the Edit Filter dialog box.

Management Properties panel

The Management Properties panel gives the user access to three views of network information. Each view is accessed by tabs on the Management Properties panel. The view tabs are:

- Topology
- Version

Note: For additional information on the Management Properties panel, refer to the online help.

Topology tab
Displays one line of information for each network

Version tab
Provides information about the software running on the CSM Management Server

View Event Log panel

The View Event Log panel displays information from the current event log file (`/var/opt/csm/hpsnm/log/hpsnmEvent.txt`) on the Management Server. When opened, the panel displays the following data columns by default:

- Invoke-Time
- Appl.-Name
- Board-MTMS
- Network
- Type
- Chip
- Port
- Message

If an event log file is not present on the CSM Management Server, the panel displays a data not available message.

Note: For additional information on the View Event Log panel, refer to the online help.

Main menu choices, View Event Log panel

File When clicked, the File menu choice gives you options to:

Open If alternate event log files have been previously saved on the Management Server, this option lets the user specify which event log file to view.

Refresh
Causes the event log data on the panel to be re-loaded from the current event log file. This selection is not available if an alternate event log file is being viewed.

Save As
Allows the user to specify a file name on the Management Server for saving the event log data in the panel.

Close Exits the current window.

View The View menu choice can be used to change the event log data displayed in the panel. The View options are:

All Columns
Displays all columns of event log data on the panel. These data columns are:
- Invoke Time
- Detail Level
- App. Name
- Board MTMS
- Network
- Type
- Frame
- Slot
- Chip
- Port
- Log Time
- Sw. TOD
- BPA TS
- Host Name
- File Name
- File Ver.
- Line No.
- Message
- Raw Data

Default Columns
Returns the set of default columns of data to the panel.

Selected Columns
Opens a dialog box with a selectable list of columns that the user can view.

Filter When clicked, the Filter menu choice gives you options to:

Edit Filter
Opens a dialog box that allows the user to enter data values that limit the amount of information displayed. For example, to see event log data for Network 1, the user enters ″1″ in the Network data field and clicks ″OK.″ The data in the refreshed View Event Log panel will only list information specific Network 1. Only columns that the user is currently viewing may be filtered; other data columns are not available.

Filter Off
Turns off all filtering and displays all lines in the view. Also clears entries in the Edit Filter dialog box.

Display Cluster Components panel

Depending on the size of the cluster, it may take a few minutes to open the Display Cluster Components panel. After it is open, the panel lists all HPSNM accessible servers and switches in the cluster. This information is presented in two sections on the panel:

- The top section provides a summary that lists the total number of frames, switches and servers in the cluster.
- The bottom section lists the frame, cage, and MTMS for each switch and server in the cluster

If the list of components is correct, clicking ″OK″ returns you to the Network Manager panel. If it is not complete, clicking ″Refresh″ causes HPSNM to restart the network exploration process and update the list of accessible servers and switches.

Select Logical Topology panel

Attention: You can only bring up the Select Logical Topology panel if HPSNM is **not** enabled.

Use this panel to select a supported topology for each network on your system. If you do not make the required topology selections, High Performance Switch Network Manager will not be available to the system. To configure the topology:

1. Open the ″Select Logical Topology″ panel
2. Using the available choices, select the topology for each network on your system
   - The topology descriptions list the maximum number of endpoints for each network. Your configuration may have fewer endpoints. Select the topology that matches the number of NSBs and ISBs in each network.
   - If you have a single network configuration, choose the topology for network one only.
   - If you have a dual network configuration, choose the topology for each separate network, not the overall system configuration.
3. Click ″OK″
4. If you have already selected an ELA Master, then you must enable HPSNM

Note: This panel can also be used to display the currently selected topology for each network on your system.

Select HPSNM ELA Master panel

The ELA Master is the HMC reporting location used by the system when a hardware event occurs. This panel is used:

- During installation
- When recovering a failed HMC
- Determining the current ELA Master HMC

Note: The current ELA Master HMC runs the active instance of Service Focal Point.

Choosing this option opens a task dialog box with two pulldown menus. The first menu allows you to choose the ″Current ELA *Master*″ HMC. The second pulldown menu allows you to choose the ″Current ELA *Backup*″ HMC. When the system detects a hardware event, HPSNM forwards that information to the master HMC for analysis. If the Master HMC determines that the event is a serviceable event, the information is opened in Service Focal Point and reported. In addition, the pulldown menus also list the ″Last Selected Master″ and the ″Last Selected Backup.″

The HPSNM command line interface

In addition to the Web-based interface (refer to 466), users can optionally access switch management functions by logging onto a cluster HMC and using the command line interface. The following High Performance Switch Network Manager commands are available:

- **chswelamast**
- **chswlogtop**

- **chswnm**
- **chswpower**
- **lsswcomp**
- **lsswendpt**
- **lsswenvir**
- **lsswmanprop**
- **lsswtopol**
- **lsswevent**
- **testlinecont**
- **verifylink**

Notes:

1. Each command supports a help flag that displays a usage statement. For additional information on command flags, refer to the man pages and online help panels for each command.
2. Only users in the group `"hpssvc"` or `"root"` may use these commands.

chswelamast

Allows the user to change the ELA Master HMC.

- Required flags:
  - **-q** Returns a list of the available HMCs, the master HMC, and the backup master HMC
- Optional flags:
  - **-m** Selects master HMC
  - **-b** Selects backup HMC
  - **-h** Help

Notes:

1. `chswelamast -m <ip address/hostname>` designates master HMC
2. `chswelamast -b <ip address/hostname>` designates backup HMC
3. `chswelamast -b none` removes current backup HMC
4. Only users in the group `"hpssvc"` or `"root"` may use this command.

chswlogtop

Allows the user to set the logical topology and to query the current logical topology setting.

Note: Only users in the group `"hpssvc"` or `"root"` may use this command.

- Required flags:
  - **-n1** Specifies the topology for a single network configuration or for network one in a multi-network configuration
    - Uses the logical topology format for a fully populated network
    - The logical topology format lists the number of NSBs, the number of ISBs, and the maximum number of end points for that switch configuration
    - For example: `chswlogtop -n1 2NSB_0ISB_32EP`
- Optional flags:
  - **-n2** Specifies the topology for network two in a multi-network configuration
  - **-q** Displays the current setting for the logical topology of the network by returning the following information:
    - The number of networks and the network ID referred to in the GUI)
    - The logical topology configuration (for example: `2NSB_0ISB_32EP`)
  - **-h** Help
- Valid topologies for the **-n1** and **-n2** flags:
  - 1NSB_0ISB_16EP
  - 2NSB_0ISB_32EP
  - 3NSB_0ISB_48EP
  - 4NSB_2ISB_64EP

– 8NSB_4ISB_128EP
– 16NSB_8ISB_256EP
– 16NSB_16ISB_256EP
– 32NSB_16ISB_512EP
– 64NSB_64ISB_1024EP
– 128NSB_128ISB_2048EP

Note: Topology options with more than 128 endpoints are only available by special bid.

chswnm

This command is used to start and stop HPSNM in several different modes. This command performs the same functions as those found on the GUI Overview panel.

Note: Only users in the group "`hpssvc`" or "`root`" may use this command.

- Flags:
  - **-a** Enables HPSNM
    - If already active, system generates return code 1
  - **-c** Starts `fnmd` in explore mode
    - If HPSNM is already active, system generates return code 1
  - **-d** Disables HPSNM
    - If already disabled, system generates return code 1
  - **-q** Queries the status of HPSNM
    - If the software is currently enabled, system generates return code 0
    - If the software is currently disabled, system generates return code 1
  - **-r** Used by `RestoreSNMUpgradeData` to uncomment the `/etc/inittab` entry for `startFNMD`
  - **-v** Starts `fnmd` in verification mode
    - If already active, system generates return code 1
  - **-h** Help

chswpower

Allows the user to power switch boards on and off.

Note: Only users in the group "`hpssvc`" or "`root`" may use this command.

- Required flags:
  - **-f** identifies frame number
  - **-g** identifies the logical frame slot (cage)
  - **-s** specifies power on or off **{on|off}**
- Optional flags:
  - No optional flags

Note: The logical frame slot (cage) identified with the **-g** flag is the logical cage number based on the UPIC plugging order. This identification number is listed in the HPSNM Switch Topology View panel and the End-Point View panel. You cannot use the EIA height or U number associated with the physical slot for the **-g** flag value.

lsswcomp

Allows the user to see the data listed in the Display Cluster Components panel of the HPSNM GUI.

Note: Only users in the group "`hpssvc`" or "`root`" may use this command.

- Required flags:
  - No required flags
- Optional flags:
  - **-h** help

lsswendpt

Allows the user to see the data displayed in the HPSNM GUI End-Point View panel. Data is shown as if all lines in the End-Point View were expanded.

Note: Only users in the group ″hpssvc″ or ″root″ may use this command.
- Required flags:
  - No required flags
- Optional flags:
  - **-F** defines output format

lsswenvir
Allows the user to view power environment information for switch boards.

Note: Only users in the group ″hpssvc″ or ″root″ may use this command.
- Required flags:
  - **-f** identifies frame number
  - **-g** identifies slot number (cage)
- Optional flags:
  - No optional flags

lsswmanprop
Allows user to see the data displayed in the GUI Management Properties panel.

Note: Only users in the group ″hpssvc″ or ″root″ may use this command.
- Required flags:
  - **-t {top | ver}** top displays switch network information, ver displays version information
- Optional flags:
  - **-F** Defines which output fields are displayed with the `-t top` flag but not with `-t ver`

lsswtopol
Intended to be used by a CE. Allows user to see the same data as is displayed in the GUI Switch Topology View panel.

Note: Only users in the group ″hpssvc″ or ″root″ may use this command.
- Required flags:
  - **-n** defines the network
- Optional flags:
  - **-F** defines output format

lsswevent
Allows user to see the data displayed in the GUI View Event Log panel. If no flags are specified, the default event log fields are written to standard output for each line of event log data in the **active** event log file, preceded by a header line.

Note: Only users in the group ″hpssvc″ or ″root″ may use this command.
- Required flags:
  - No required flags
- Optional flags:
  - **-a** Specifies that all event log fields are displayed (cannot be used with -F)
  - **-f** Specifies a specific event log file for information display
  - **-F** Defines which output fields are displayed (cannot be used with -a)

testlinecont
Allows user to perform the Line Continuity diagnostic test. This command has required and optional flags that limit the components tested.

Note: Only users in the group ″hpssvc″ or ″root″ may use this command.
- Required flags:
  - **-f** identifies frame number
  - **-g** identifies the logical frame slot (cage)
- Optional flags:
  - **-c** identifies chip number

– **-o** identifies port number
– **-a** identifies SNI number (Switch Network Interface)

Note: SNIs are referred to as adapters in the HPSNM GUI.
– **-n** specifies that testing proceed without confirmation prompts

Notes:

1. The line continuity test is a disruptive test. Therefore, the system issues a confirmation prompt before each link is tested. If you want the tests to proceed **without** prompts, the optional **-n** flag may be used to suppress confirmation prompts.
2. The logical frame slot (cage) identified with the **-g** flag is the logical cage number based on the UPIC plugging order. This identification number is listed in the HPSNM Switch Topology View panel and the End-Point View panel. You cannot use the EIA height or U number associated with the physical slot for the **-g** flag value.

verifylink
Intended to be used by a CE. Allows user to perform the Verify Link diagnostic test. This command has required and optional flags that limit the components tested.

Note: Only users in the group "`hpssvc`" or "`root`" may use this command.

- Required flags:
  – **-f** identifies frame number
  – **-g** identifies the logical frame slot (cage)
- Optional flags:
  – **-c** identifies chip number
  – **-o** identifies port number
  – **-a** identifies SNI number (Switch Network Interface)

Notes:

1. SNIs are referred to as adapters in the HPSNM GUI.
2. The logical frame slot (cage) identified with the **-g** flag is the logical cage number based on the UPIC plugging order. This identification number is listed in the HPSNM Switch Topology View panel and the End-Point View panel. You cannot use the EIA height or U number associated with the physical slot for the **-g** flag value.

Switch network discovery

At various times during the installation process or whenever you start High Performance Switch Network Manager, HPSNM automatically scans the network. This section describes what activities take place during the network discovery process which includes:

1. "Switch initialization"
2. "Topology recognition" on page 479

Note: These activities do not require any user input and they take place in either Verification Mode or Normal Mode. This information is only provided for your reference.

Switch initialization

Switch initialization begins when the switches are powered up from the CSM Management Server (or when power is applied to the frame BPA) during the physical install process. Issuing the power up command from the Management Server begins the following sequence of events:

1. The Switch Service Processors (SSPs) power up the switches and write the frame number to the Location ID Register on each switch chip.
2. The SSP disables and then enables each switch port. This action transmits the Location ID Register and port number to each adjacent chip. Each chip saves that information in its Neighbor ID Register and Neighbor Ports Register.

3. Similar information transfers are also completed for each SNI. Each SNI stores information in its Location ID Register that identifies the chips for that SNI. In addition, information for the neighboring SNIs gets stored in the Neighbor ID Register and Neighbor Ports Register.
4. High Performance Switch Network Manager then:
   - Searches the network
   - Reads all Location ID Registers, Neighbor ID Registers and Neighbor Ports Registers and collects Port Riser Type information
   - Writes all register and riser information to the HPSNM Device Database on the HMC
   - Initializes all hardware control registers
5. HPSNM analyzes the connection information and determines the composition of the switch network
6. HPSNM amends the Device Database with the connection information and logs miswire information for later access (refer to "Topology recognition")

At this point of the initialization process, HPSNM also enables error reporting by switch chips and adapters. Any errors reported at this point are handled by switch initialization code rather than recovery code. As necessary, ports are disabled and the Device Database is amended to reflect this.

At the end of the initialization process, HPSNM accesses the information stored in the Device Database. From that information, HPSNM constructs a command and sends it to the Flexible Service Processor. This command initiates a sequence of events:
1. The FSP computes network routes for the adapters
2. When the routes and path tables are completed, the FSP:
   - Reloads the adapter microcode
   - Loads the routes onto the adapters
3. FSP marks the adapters (chips) ready for message passing

Notes:
1. When you open or refresh either the Switch Topology View panel or the End-Point View panel, HPSNM queries the database for topology updates.
2. If FSP is not able to download the route, mp-available does not activate and the SNIs will not pass data.
   - When mp-available does not activate, FSP reports the problem to HPSNM.

Topology recognition

Once the connection information has been stored in the Device Database and HPSNM is running in verification mode, the network manager software determines the topology of the switch network as follows:
1. HPSNM selects a switch and uses the connection information in the Device Database to determine all SNIs which can be reached from that switch.
2. HPSNM sets a network identifier in all Device Database records for that network.
3. HPSNM counts the number of boards in the network and uses that number to guess the topology of the network. If the number of boards falls between two possible topologies, the larger configuration is chosen.
4. HPSNM uses the ideal topology connection information to sort out the ISBs.
5. HPSNM uses the ideal topology connection information to sort out the NSBs.
   - At this stage, if HPSNM finds that the previous topology guess is wrong a new guess will be made.
   - If the network has too many mis-wires, HPSNM will halt the process and report this problem.
6. HPSNM uses the Device Database to place the switch boards in order by assigning logical numbers to the switches. The generated switch order is then used by Route Generation code.
7. After completing the system analysis, HPSNM writes the switch and network information into a file. HPSNM uses the information in this file during normal operation to make certain that the network ids are assigned to the same physical network each time HPSNM starts in normal mode.

8. HPSNM checks the sorted connection information against the ideal for miswires.
9. When CECs power up, HPSNM checks the CEC location information for miswired adapters (such as an SNI port wired to a switch-to-switch port).

HPSNM diagnostics and error recovery

High Performance Switch Network Manager provides a user interface for network diagnostics and error recovery. For detailed information on these processes, refer to:

- “Diagnostics”
- “Error recovery” on page 482

Diagnostics

High Performance Switch Network Diagnostics (HPSND) can be executed from the CSM Management Server using either the IBM Web-based System Manager GUI or from the command line interface. Both the GUI and command line interfaces allow the user to select diagnostic tools and target specific network components. HPSNDSND also provides access to other HMC applications including Inventory Scout and other HPSNM applications including recovery and initialization tools. HPSNDSND includes the following diagnostic utilities:

- “Line continuity”
- “Wrap testing”
- “Link verification” on page 481
- “Error Log Analysis (ELA)” on page 481

In general, the diagnostic tools exercise the components under test by sending data through them to verify their function and connectivity. HPSNM communicates with the targeted service processor (CSP or SSP) over the HPS Service Network. In addition, HPSNM also sets a diagnostic state for the component in the service processor so that errors are not reported to AIX.

Notes:

1. Refer to “Location codes” on page 145 for a listing of HPS devices. Table 35 on page 149 in that unit lists the location codes for server SNI ports referenced in the error logs.
2. Refer to “Running diagnostics from HPSNM” on page 172 in the Chapter 9, “Service procedures” for specific information on running network diagnostics from High Performance Switch Network Manager.

Line continuity

The line continuity diagnostic tool can determine if switch riser cards or cables need to be reseated or replaced. This is accomplished by reading the associated switch chip registers to verify that the chip can communicate with the attached LDC on the riser card. It next checks continuity by setting up diagnostics registers in the targeted chips to perform differential line testing on the components under test and verifying the results.

The line continuity tool is selectable from the main ″Diagnostics″ panel of the HPSNDSND GUI panel. Service personnel can run this tool against a single link. Results are displayed on the GUI interface as pass or fail for each link under test. If any test failures are encountered, the tool writes the results to the error log.

Note: The line continuity test will disrupt the selected components if they are operational. Therefore, the system displays a warning message prior to starting the test.

Wrap testing

Wrap testing isolates malfunctioning components on a HPS network. The possible failing FRUs include:

- Switch boards
- Switch risers

- Cables
- SNI cards

Note: Wrap testing will disrupt the selected components if they are operational. Therefore, the system displays a warning message prior to starting the test.

Wrap tests are invoked from the ″Diagnostics″ panel of the GUI Topology window by selecting ″Wrap test.″ Once a link is selected, the HPSNDSND application determines whether the link type is switch-to-switch or switch-to-adapter and runs the appropriate diagnostic test. When needed, the application presents information windows requesting various service actions such as plugging wrap assemblies. In addition, the information windows contain frame, jack, and LED guide path information.

The following wrap functions are available for use during this procedure:

- Switch Wrap
  - Tests the ability of the switch chip to send data to and receive data from the selected riser port
  - Test requires riser wrap assembly
- Riser Wrap
  - Tests both copper and fiber-optic riser types and verifies the ability of the riser port to drive data over the cable
  - Test requires wrap assembly (a 5 meter cable with the appropriate cable wrap plug installed)
- Adapter Wrap
  - Verifies the ability of the SNI to drive data over the cable
  - Test requires wrap assembly (a 5 meter cable with the appropriate cable wrap plug installed)

After completing the wrap test, HPSNM reports the result and if a failing FRU is identified, the user can choose to create a serviceable event.

Link verification

The Link Verification Test is accessed from the HPSNM ″Topology″ panel. The Link Verification Test concurrently verifies the operation of a network link by performing end to end testing of the specified link. Link verification delivers a pass or fail result and makes no attempt to isolate specific components in the link under test. Link verification can be invoked on a specific link or on all links of a switch chip or SNI.

Error Log Analysis (ELA)

In many cases, a specific failing FRU cannot be determined from a single error log entry. However, the Error Log Analysis tool looks for HPSNM related errors and error patterns in the HMC error log across a specified time interval. By looking at the errors logged over a period of time, Error Log Analysis can determine if a specific FRU is at fault and forward that information to the SFP application for processing. In some cases ELA may not define a specific FRU and additional diagnostic tests may be required.

Notes:

1. Some HPSNM error log entries may not result in ELA suggesting a service action. Accurate results depend on consistent HMC error log entries from other HPSNM applications and on log entries for switch and server power events and checkstops.
2. For all Cluster 1600 configurations, ELA must be running on **all** HMCs in the cluster. However, the error log on the ELA Master HMC receives hardware events from HPSNM running on the CSM Management Server. Refer to “Select HPSNM ELA Master panel” on page 474 for information on that process.

ELA processing has three stages:

1. Selection
   - Errors are extracted from the error log for a specific period of time. The interval is usually set to the last 24 hours but may be set for longer periods.
2. Filtering

- HPSNM forwards error log data from the CSM Management Server to the ELA Master HMC. ELA then determines if the error is listed in the Filtering Table. If the error is listed on the table, ELA will continue with error analysis. If the error is not listed in the filtering table, it is ignored.
3. Analysis
   - During this stage, ELA looks for error patterns that constitute an event. If an event is found, the software generates a specific action such as creating a serviceable event or suggesting further diagnostic procedures. When ELA needs to generate a serviceable event:
     a. ELA sends the data to Problem Manager
     b. Problem Manager compares the new data to the data in SFP and determines if:
        – A new problem needs to be opened in SFP
        – An existing, open problem in SFP needs to be altered
        – A closed problem in SFP needs to be reopened

Notes:
1. When you boot up the HMC, the system initiates both ELA and the Problem Analysis Framework software.
2. ELA performs analysis whenever an entry is placed in the error log on the ELA Master HMC.

Error recovery

Compared to previous SP type switch networks, errors on a HPS network are processed in a completely different manner. With previous switch networks, switch network servicing was processed over regular data paths on the switch network. With HPS networks, switch network servicing is processed over the HPS Service Network leaving all data pathways open for network traffic. In addition, the error handling capabilities of the HPS and Switch Network Interfaces (SNIs) have been improved by allowing firmware to make most of the error handling decisions. Previous switch types relied on software decision for error reporting and recovery. Errors processed by HPS firmware include:
- Link level retries
- Automatic recovery from several hardware errors
- TOD Master fail-over

With previous switch management tools, recovery software removed links or disabled devices when hard errors were encountered or error thresholds were reached. In comparison, High Performance Switch Network Manager will only remove network resources for link outages such as ″Link Synchronization Failed″ or excessive retry failures. Additionally, HPSNM does not regenerate routes for every network error detected. This allows the network to remain available under certain error conditions even though the bandwidth between ports may be unbalanced. HPSNM is able to maintain an unbalanced network until the problem is resolved or a threshold is reached and rebalancing is required.

There are two basic error types which may cause the HPSNM recovery component to perform action. They are:

Switch errors
Switch errors are reported to HPSNM by the respective SSP. If a HPS chip encounters an error, the chip sends a message to the SSP for its board and the SSP reports the error to the Management Server. From the Management Server, HPSNM analyzes the error, performs recovery action, and logs the error to the ELA Master HMC. On the Master HMC, ELA determines if the event is a serviceable event that must be reported. If a link goes down, HPSNM updates route tables.

Note: Switch error and FRU identification codes are listed in Appendix A, “FRU identification codes,” on page 239

SNI errors
SNI errors are reported to SFP through one of two different processes:
- The event is internal to an SNI or involves the server GX+ bus:

1. The Flexible Support Processor (FSP) receives the server event information
2. FSP makes the FRU call and forwards the event information to:
   – SFP on the HMC controlling the CEC associated with the SNI
     - For this reporting process, SFP creates the serviceable event on this HMC
   – HPSNM on the CSM Management Server
3. HPSNM on the Management Server logs the event information to ELA on the Master HMC and informs the system that the FRU call has already been made by the FSP
   – If the SNI or server bus event causes a link failure on the switch, ELA will be able to recognize that the switch error is associated with the FRU call made by FSP and ELA will ignore the switch event

- The event is associated with a link or network error:
  1. The Flexible Support Processor (FSP) receives the event information but it **does not** make the FRU call
  2. FSP forwards the event information to HPSNM on the CSM Management Server
     – In this instance, the event information **does not** get forwarded to the HMC controlling the server
  3. HPSNM logs the event to the ELA Master HMC
  4. ELA recognizes that a FRU call has not been made and, unless there is another event that supersedes this one in priority, ELA reports the event to SFP on the ELA Master HMC
  5. SFP on the ELA Master HMC makes the FRU call and replicates the event across all HMCs in the cluster

Notes:

1. With both processes, the system notifies HPSNM about the event. However, in some cases, the serviceable event is found on the HMC controlling the CEC associated with the SNI. For other cases, the serviceable event is found on the HPSNM ELA Master HMC. Because there are different reporting methods, you **must** check **all** instances of SFP running on the cluster. If you rely on the Master HMC error logs and you do not check each HMC, some SNI errors may not be resolved. These problems may affect network performance. To check all instances of SFP:
   - If Customer Notify and Call Home **are not** enabled, you must open a WebSM session from the CSM Management Server to look at each HMC and review the SFP error reports for that HMC
   - If Customer Notify or Call Home **are** enabled, you can use the report sent by these services to find the HMC with the serviceable event
2. Switch error and FRU identification codes are listed in Appendix A, “FRU identification codes,” on page 239. That information includes the SNI reported errors for which ELA makes the FRU call.

If an HPS error is reported that has not being reported by other means, HPSNM records the problem in the ELA Master HMC error log. ELA then uses that information to determine if a serviceable event needs to be reported by SFP. In addition to the entries it writes to the ELA Master HMC error log, HPSNM maintain its own event log on the CSM Management Server.

Note: The entries made to the ELA Master HMC error log are special cases of the HPSNM event log on the Management Server.

Errors logged by HPSNM belong to one of two categories:

Errors that can be reported directly from the Flexible Service Processor (FSP)

FSP reported serviceable event include:

- Internal SNI failures
- A server failure (such as a checkstop) that results in a switch network failure

- Switch power failures
- BPA failures in a switch-only frame

Errors that must be processed by the ELA Master HMC before they are reported

ELA reported serviceable event include:

- Network link failure
- Switch chip failure
- Switch board failure

Notes:

1. The errors listed in these groups are for clusters configured with the HPS and IBM eserver p5 servers. Some errors may be reported differently if other server types are used in the cluster.
2. The trace log file may be viewed from the HPSNM panels in the Web-based System Manager GUI.

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Glossary

A

ACL. Access Control List. A list that defines who has permission to access certain services; that is, for whom a server may perform certain tasks. This is usually a list of principals with the type of access assigned to each.

adapter. An adapter is a mechanism for attaching parts. For example, an adapter could be a part that electrically or physically connects a device to a computer or to another device. In the SP system, network connectivity is supplied by various adapters, some optional, that can provide connection to I/O devices, networks of workstations, and mainframe networks. Ethernet, FDDI, token-ring, HiPPI, SCSI, FCS, and ATM are examples of adapters that can be used as part of an SP system.

address. A character or group of characters that identifies a register, a device, a particular part of storage, or some other data source or destination.

AFS. A distributed file system that provides authentication services as part of its file system creation.

AIX. Abbreviation for Advanced Interactive Executive, IBM's licensed version of the UNIX® operating system. AIX is particularly suited to support technical computing applications, including high function graphics and floating point computations.

Amd. Berkeley Software Distribution automount daemon.

API. Application Programming Interface. A set of programming functions and routines that provide access between the Application layer of the OSI seven-layer model and applications that want to use the network. It is a software interface.

application. The use to which a data processing system is put; for example, a payroll application, an airline reservation application.

application data. The data that is produced using an application program.

ARP. Address Resolution Protocol.

ATM. Asynchronous Transfer Mode. (See *TURBOWAYS 100 ATM Adapter*.)

authentication. The process of validating the identity of either a user of a service or the service itself. The process of a principal proving the authenticity of its identity.

authorization. The process of obtaining permission to access resources or perform tasks. In SP security services, authorization is based on the principal identifier. The granting of access rights to a principal.

authorization file. A type of ACL (access control list) used by the IBM AIX remote commands and the IBM PSSP Sysctl and Hardmon components.

B

batch processing. * (1) The processing of data or the accomplishment of jobs accumulated in advance in such a manner that each accumulation thus formed is processed or accomplished in the same run. * (2) The processing of data accumulating over a period of time. * (3) Loosely, the execution of computer programs serially. (4) Computer programs executed in the background.

BMCA. Block Multiplexer Channel Adapter. The block multiplexer channel connection allows the RS/6000 to communicate directly with a host System/370 or System/390; the host operating system views the system unit as a control unit.

BOS. The AIX Base Operating System.

C

call home function. The ability of a system to call the IBM support center and open a PMR to have a repair scheduled.

CDE. Common Desktop Environment. A graphical user interface for UNIX.

charge feature. An optional feature for either software or hardware for which there is a charge.

CLI. Command Line Interface.

client. * (1) A function that requests services from a server and makes them available to the user. * (2) A term used in an environment to identify a machine that uses the resources of the network.

Client Input/Output Sockets (CLIO/S). A software package that enables high-speed data and tape access between SP systems, AIX systems, and ES/9000 mainframes.

CLIO/S. Client Input/Output Sockets.

CMI. Centralized Management Interface provides a series of SMIT menus and dialogues used for defining and querying the SP system configuration.

Concurrent Virtual Shared Disk. A virtual shared disk that can be concurrently accessed by more than one server.

connectionless. A communication process that takes place without first establishing a connection.

connectionless network. A network in which the sending logical node must have the address of the receiving logical node before information interchange can begin. The packet is routed through nodes in the network based on the destination address in the packet. The originating source does not receive an acknowledgment that the packet was received at the destination.

control workstation. A single point of control allowing the administrator or operator to monitor and manage the SP system using the IBM AIX Parallel System Support Programs.

credentials. A protocol message, or part thereof, containing a ticket and an authenticator supplied by a client and used by a server to verify the client's identity.

css. Communication subsystem.

D

daemon. A process, not associated with a particular user, that performs system-wide functions such as administration and control of networks, execution of time-dependent activities, line printer spooling and so forth.

DASD. Direct Access Storage Device. Storage for input/output data.

DCE. Distributed Computing Environment.

DFS. distributed file system. A subset of the IBM Distributed Computing Environment.

DNS. Domain Name Service. A hierarchical name service which maps high level machine names to IP addresses.

E

Error Notification Object. An object in the SDR that is matched with an error log entry. When an error log entry occurs that matches the Notification Object, a user-specified action is taken.

ESCON. Enterprise Systems Connection. The ESCON channel connection allows the RS/6000 to communicate directly with a host System/390; the host operating system views the system unit as a control unit.

Ethernet. (1) Ethernet is the standard hardware for TCP/IP local area networks in the UNIX marketplace. It is a 10-megabit per second baseband type LAN that allows multiple stations to access the transmission medium at will without prior coordination, avoids contention by using carrier sense and deference, and resolves contention by collision detection (CSMA/CD). (2) A passive coaxial cable whose interconnections contain devices or components, or both, that are all active. It uses CSMA/CD technology to provide a best-effort delivery system.

Ethernet network. A baseband LAN with a bus topology in which messages are broadcast on a coaxial cabling using the carrier sense multiple access/collision detection (CSMA/CD) transmission method.

event. In Event Management, the notification that an expression evaluated to true. This evaluation occurs each time an instance of a resource variable is observed.

expect. Programmed dialogue with interactive programs.

expression. In Event Management, the relational expression between a resource variable and other elements (such as constants or the previous value of an instance of the variable) that, when true, generates an event. An example of an expression is `X < 10` where X represents the resource variable `IBM.PSSP.aixos.PagSp.%totalfree` (the percentage of total free paging space). When the expression is true, that is, when the total free paging space is observed to be less than 10%, the Event Management subsystem generates an event to notify the appropriate application.

F

failover. Also called fallover, the sequence of events when a primary or server machine fails and a secondary or backup machine assumes the primary workload. This is a disruptive failure with a short recovery time.

fall back. Also called fallback, the sequence of events when a primary or server machine takes back control of its workload from a secondary or backup machine.

FDDI. Fiber Distributed Data Interface.

FFDC. First Failure Data Capture.

Fiber Distributed Data Interface (FDDI). An American National Standards Institute (ANSI) standard for 100-megabit-per-second LAN using optical fiber cables. An FDDI local area network (LAN) can be up to 100 km (62 miles) and can include up to 500 system units. There can be up to 2 km (1.24 miles) between system units and concentrators.

file. * A set of related records treated as a unit, for example, in stock control, a file could consist of a set of invoices.

file name. A CMS file identifier in the form of 'filename filetype filemode' (like: TEXT DATA A).

file server. A centrally located computer that acts as a storehouse of data and applications for numerous users of a local area network.

File Transfer Protocol (FTP). The Internet protocol (and program) used to transfer files between hosts. It is an application layer protocol in TCP/IP that uses TELNET and TCP protocols to transfer bulk-data files between machines or hosts.

First Failure Data Capture (FFDC). A set of utilities used for recording persistent records of failures and significant software incidents. It provides a means of associating failures to one another, thus allowing software to link effects of a failure to their causes and thereby facilitating discovery of the root cause of a failure.

foreign host. Any host on the network other than the local host.

FTP. File transfer protocol.

G

gateway. An intelligent electronic device interconnecting dissimilar networks and providing protocol conversion for network compatibility. A gateway provides transparent access to dissimilar networks for nodes on either network. It operates at the session presentation and application layers.

H

HACMP. High Availability Cluster Multi-Processing for AIX.

HACWS. High Availability Control Workstation function, based on HACMP, provides for a backup control workstation for the SP system.

HAL. Hardware Abstraction Layer, a communication device interface that provides communication channels for processes.

Hashed Shared Disk (HSD). The data striping device for the IBM Virtual Shared Disk. The device driver lets application programs stripe data across physical disks in multiple IBM Virtual Shared Disks, thus reducing I/O bottlenecks.

help key. In the SP graphical interface, the key that gives you access to the SP graphical interface help facility.

High Availability Cluster Multi-Processing. An IBM facility to cluster nodes or components to provide high availability by eliminating single points of failure.

HiPPI. High Performance Parallel Interface. RS/6000 units can attach to a HiPPI network as defined by the ANSI specifications. The HiPPI channel supports burst rates of 100 Mbps over dual simplex cables; connections can be up to 25 km in length as defined by the standard and can be extended using third-party HiPPI switches and fiber optic extenders.

home directory. The directory associated with an individual user.

host. A computer connected to a network, and providing an access method to that network. A host provides end-user services.

I

instance vector. Obsolete term for resource identifier.

Intermediate Switch Board. Switches used for switch-to-switch communication.

Internet. A specific inter-network consisting of large national backbone networks such as APARANET, MILNET, and NSFnet, and a myriad of regional and campus networks all over the world. The network uses the TCP/IP protocol suite.

Internet Protocol (IP). (1) A protocol that routes data through a network or interconnected networks. IP acts as an interface between the higher logical layers and the physical network. This protocol, however, does not provide error recovery, flow control, or guarantee the reliability of the physical network. IP is a connectionless protocol. (2) A protocol used to route data from its source to it destination in an Internet environment.

IP address. A 32-bit address assigned to devices or hosts in an IP internet that maps to a physical address. The IP address is composed of a network and host portion.

ISB. Intermediate Switch Board.

K

Kerberos. A service for authenticating users in a network environment.

kernel. The core portion of the UNIX operating system which controls the resources of the CPU and allocates them to the users. The kernel is memory-resident, is said to run in "kernel mode" and is protected from user tampering by the hardware.

Kernel Low-Level Application Programming Interface (KLAPI). KLAPI provides transport service for communication using the SP Switch.

L

LAN. (1) Acronym for Local Area Network, a data network located on the user's premises in which serial transmission is used for direct data communication among data stations. (2) Physical network technology that transfers data a high speed over short distances. (3) A network in which a set of devices is connected to another for communication and that can be connected to a larger network.

local host. The computer to which a user's terminal is directly connected.

log database. A persistent storage location for the logged information.

log event. The recording of an event.

log event type. A particular kind of log event that has a hierarchy associated with it.

logging. The writing of information to persistent storage for subsequent analysis by humans or programs.

M

mask. To use a pattern of characters to control retention or elimination of portions of another pattern of characters.

menu. A display of a list of available functions for selection by the user.

Motif. The graphical user interface for OSF, incorporating the X Window System. Also called OSF/Motif.

MTBF. Mean time between failure. This is a measure of reliability.

MTTR. Mean time to repair. This is a measure of serviceability.

N

naive application. An application with no knowledge of a server that fails over to another server. Client to server retry methods are used to reconnect.

network. An interconnected group of nodes, lines, and terminals. A network provides the ability to transmit data to and receive data from other systems and users.

NFS. Network File System. NFS allows different systems (UNIX or non-UNIX), different architectures, or vendors connected to the same network, to access remote files in a LAN environment as though they were local files.

NIM. Network Installation Management is provided with AIX to install AIX on the nodes.

NIM client. An AIX system installed and managed by a NIM master. NIM supports three types of clients:
- Standalone
- Diskless
- Dataless

NIM master. An AIX system that can install one or more NIM clients. An AIX system must be defined as a NIM master before defining any NIM clients on that system. A NIM master managers the configuration database containing the information for the NIM clients.

NIM object. A representation of information about the NIM environment. NIM stores this information as objects in the NIM database. The types of objects are:
- Network
- Machine
- Resource

NIS. Network Information System.

node. In a network, the point where one or more functional units interconnect transmission lines. A computer location defined in a network. The SP system can house several different types of nodes for both serial and parallel processing. These node types can include thin nodes, wide nodes, 604 high nodes, as well as other types of nodes both internal and external to the SP frame.

Node Switch Board. Switches used for node-to-switch communication.

NSB. Node Switch Board.

NTP. Network Time Protocol.

O

ODM. Object Data Manager. In AIX, a hierarchical object-oriented database for configuration data.

P

parallel environment. A system environment where message passing or SP resource manager services are used by the application.

Parallel Environment. A licensed IBM program used for message passing applications on the SP or RS/6000 platforms.

parallel processing. A multiprocessor architecture which allows processes to be allocated to tightly coupled multiple processors in a cooperative processing environment, allowing concurrent execution of tasks.

parameter. * (1) A variable that is given a constant value for a specified application and that may denote the application. * (2) An item in a menu for which the operator specifies a value or for which the system provides a value when the menu is interpreted. * (3) A name in a procedure that is used to refer to an argument that is passed to the procedure. * (4) A particular piece of information that a system or application program needs to process a request.

partition. See system partition.

Perl. Practical Extraction and Report Language.

perspective. The primary window for each SP Perspectives application, so called because it provides a unique view of an SP system.

pipe. A UNIX utility allowing the output of one command to be the input of another. Represented by the | symbol. It is also referred to as filtering output.

PMR. Problem Management Report.

POE. Formerly Parallel Operating Environment, now Parallel Environment for AIX.

port. (1) An end point for communication between devices, generally referring to physical connection. (2) A 16-bit number identifying a particular TCP or UDP resource within a given TCP/IP node.

predicate. Obsolete term for expression.

Primary node or machine. (1) A device that runs a workload and has a standby device ready to assume the primary workload if that primary node fails or is taken out of service. (2) A node on the switch that initializes, provides diagnosis and recovery services, and performs other operations to the switch network. (3) In IBM Virtual Shared Disk function, when physical disks are connected to two nodes (twin-tailed), one node is designated as the primary node for each disk and the other is designated the secondary, or backup, node. The primary node is the server node for IBM Virtual Shared Disks defined on the physical disks under normal conditions. The secondary node can become the server node for the disks if the primary node is unavailable (off-line or down).

Problem Management Report. The number in the IBM support mechanism that represents a service incident with a customer.

process. * (1) A unique, finite course of events defined by its purpose or by its effect, achieved under defined conditions. * (2) Any operation or combination of operations on data. * (3) A function being performed or waiting to be performed. * (4) A program in operation. For example, a daemon is a system process that is always running on the system.

protocol. A set of semantic and syntactic rules that defines the behavior of functional units in achieving communication.

R

RAID. Redundant array of independent disks.

rearm expression. In Event Management, an expression used to generate an event that alternates with an original event expression in the following way: the event expression is used until it is true, then the rearm expression is used until it is true, then the event expression is used, and so on. The rearm expression is commonly the inverse of the event expression (for example, a resource variable is on or off). It can also be used with the event expression to define an upper and lower boundary for a condition of interest.

rearm predicate. Obsolete term for rearm expression.

remote host. *See foreign host*.

resource. In Event Management, an entity in the system that provides a set of services. Examples of resources include hardware entities such as processors, disk drives, memory, and adapters, and software entities such as database applications, processes, and file systems. Each resource in the system has one or more attributes that define the state of the resource.

resource identifier. In Event Management, a set of elements, where each element is a name/value pair of the form `name=value`, whose values uniquely identify the copy of the resource (and by extension, the copy of the resource variable) in the system.

resource monitor. A program that supplies information about resources in the system. It can be a command, a daemon, or part of an application or subsystem that manages any type of system resource.

resource variable. In Event Management, the representation of an attribute of a resource. An example of a resource variable is `IBM.AIX.PagSp.%totalfree`, which represents the percentage of total free paging space. `IBM.AIX.PagSp` specifies the resource name and `%totalfree` specifies the resource attribute.

RISC. Reduced Instruction Set Computing (RISC), the technology for today's high performance personal computers and workstations, was invented in 1975. Uses a small simplified set of frequently used instructions for rapid execution.

rlogin (remote LOGIN). A service offered by Berkeley UNIX systems that allows authorized users of one machine to connect to other UNIX systems across a network and interact as if their terminals were connected directly. The rlogin software passes information about the user's environment (for example, terminal type) to the remote machine.

RPC. Acronym for Remote Procedure Call, a facility that a client uses to have a server execute a procedure call. This facility is composed of a library of procedures plus an XDR.

RSH. A variant of RLOGIN command that invokes a command interpreter on a remote UNIX machine and passes the command line arguments to the command interpreter, skipping the LOGIN step completely. See also *rlogin*.

S

SCSI. Small Computer System Interface.

Secondary node. In IBM Virtual Shared Disk function, when physical disks are connected to two nodes (twin-tailed), one node is designated as the primary node for each disk and the other is designated as the secondary, or backup, node. The secondary node acts as the server node for the IBM Virtual Shared disks defined on the physical disks if the primary node is unavailable (off-line or down).

server. (1) A function that provides services for users. A machine may run client and server processes at the same time. (2) A machine that provides resources to the network. It provides a network service, such as disk storage and file transfer, or a program that uses such a service. (3) A device, program, or code module on a network dedicated to providing a specific service to a network. (4) On a LAN, a data station that provides facilities to other data stations. Examples are file server, print server, and mail server.

Node Switch Board. Switches mounted on frames that contain servers (nodes).

shell. The shell is the primary user interface for the UNIX operating system. It serves as command language interpreter, programming language, and allows foreground and background processing. There are three different implementations of the shell concept: Bourne, C and Korn.

Small Computer System Interface (SCSI). An input and output bus that provides a standard interface for the attachment of various direct access storage devices (DASD) and tape drives to the RS/6000.

Small Computer Systems Interface Adapter (SCSI Adapter). An adapter that supports the attachment of various direct-access storage devices (DASD) and tape drives to the RS/6000.

SMIT. The System Management Interface Toolkit is a set of menu driven utilities for AIX that provides functions such as transaction login, shell script creation, automatic updates of object database, and so forth.

SNMP. Simple Network Management Protocol. (1) An IP network management protocol that is used to monitor attached networks and routers. (2) A TCP/IP-based protocol for exchanging network management information and outlining the structure for communications among network devices.

socket. (1) An abstraction used by Berkeley UNIX that allows an application to access TCP/IP protocol functions. (2) An IP address and port number pairing. (3) In TCP/IP, the Internet address of the host computer on which the application runs, and the port number it uses. A TCP/IP application is identified by its socket.

NSB. Node Switch Board.

standby node or machine. A device that waits for a failure of a primary node in order to assume the identity of the primary node. The standby machine then runs the primary's workload until the primary is back in service.

subnet. Shortened form of subnetwork.

subnet mask. A bit template that identifies to the TCP/IP protocol code the bits of the host address that are to be used for routing for specific subnetworks.

subnetwork. Any group of nodes that have a set of common characteristics, such as the same network ID.

subsystem. A software component that is not usually associated with a user command. It is usually a daemon process. A subsystem will perform work or provide services on behalf of a user request or operating system request.

SUP. Software Update Protocol.

switch capsule. A group of SP frames consisting of a switched frame and its companion non-switched frames.

Sysctl. Secure System Command Execution Tool. An authenticated client/server system for running commands remotely and in parallel.

syslog. A BSD logging system used to collect and manage other subsystem's logging data.

System Administrator. The user who is responsible for setting up, modifying, and maintaining the SP system.

system partition. A group of nonoverlapping nodes on a switch chip boundary that act as a logical SP system.

T

tar. Tape ARchive, is a standard UNIX data archive utility for storing data on tape media.

TaskGuides. SP TaskGuides are a form of advanced online assistance designed to walk you through complex or infrequently performed tasks. Each TaskGuide does not simply list the required steps. It actually performs the steps for you, automating the steps to the highest degree possible and prompting you for input only when absolutely necessary. You might recognize them as *wizards*.

Tcl. Tool Command Language.

TclX. Tool Command Language Extended.

TCP. Acronym for Transmission Control Protocol, a stream communication protocol that includes error recovery and flow control.

TCP/IP. Acronym for Transmission Control Protocol/Internet Protocol, a suite of protocols designed to allow communication between networks regardless of the technologies implemented in each network. TCP provides a reliable host-to-host protocol between hosts in packet-switched communications networks and in interconnected systems of such networks. It assumes that the underlying protocol is the Internet Protocol.

Telnet. Terminal Emulation Protocol, a TCP/IP application protocol that allows interactive access to foreign hosts.

ticket. An encrypted protocol message used to securely pass the identity of a user from a client to a server.

Tk. Tcl-based Tool Kit for X Windows®.

TMPCP. Tape Management Program Control Point.

token-ring. (1) Network technology that controls media access by passing a token (special packet or frame) between media-attached machines. (2) A network with a ring topology that passes tokens from one attaching device (node) to another. (3) The IBM Token-Ring LAN connection allows the RS/6000 system unit to participate in a LAN adhering to the IEEE 802.5 Token-Passing Ring standard or the ECMA standard 89 for Token-Ring, baseband LANs.

transaction. An exchange between the user and the system. Each activity the system performs for the user is considered a transaction.

transceiver (transmitter-receiver). A physical device that connects a host interface to a local area network, such as Ethernet. Ethernet transceivers contain electronics that apply signals to the cable and sense collisions.

transfer. To send data from one place and to receive the data at another place. Synonymous with move.

transmission. * The sending of data from one place for reception elsewhere.

TURBOWAYS 100 ATM Adapter. An IBM high-performance, high-function intelligent adapter that provides dedicated 100 Mbps ATM (asynchronous transfer mode) connection for high-performance servers and workstations.

U

UDP. User Datagram Protocol.

UNIX operating system. An operating system developed by Bell Laboratories that features multiprogramming in a multiuser environment. The UNIX operating system was originally developed for use on minicomputers, but has been adapted for mainframes and microcomputers. **Note:** The AIX operating system is IBM's implementation of the UNIX operating system.

user. Anyone who requires the services of a computing system.

User Datagram Protocol (UDP). (1) In TCP/IP, a packet-level protocol built directly on the Internet Protocol layer. UDP is used for application-to-application programs between TCP/IP host systems. (2) A transport protocol in the Internet suite of protocols that provides unreliable, connectionless datagram service. (3) The Internet Protocol that enables an application programmer on one machine or process to send a datagram to an application program on another machine or process.

user ID. A nonnegative integer, contained in an object of type *uid_t*, that is used to uniquely identify a system user.

V

Virtual Shared Disk, IBM. The function that allows application programs executing at different nodes of a system partition to access a raw logical volume as if it were local at each of the nodes. In actuality, the logical volume is local at only one of the nodes (the server node).

W

workstation. * (1) A configuration of input/output equipment at which an operator works. * (2) A terminal or microcomputer, usually one that is connected to a mainframe or to a network, at which a user can perform applications.

X

X Window System. A graphical user interface product.

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